SOIL SURVEY OF DEUEL COUNTY, NEBRASKA.

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DESCRIPTION OF THE AREA.

Deuel County is situated in the western part of Nebraska, in the southeastern corner of the panhandle adjoining Colorado. Chappell, the county seat, is 377 miles by rail west of Omaha and 129 miles east of Cheyenne, Wyo. The county is nearly rectangular in outline, and has a length of approximately 30 miles east and west and a width of 15 miles north and south. Its area is 439 square miles, or 280,960 acres.

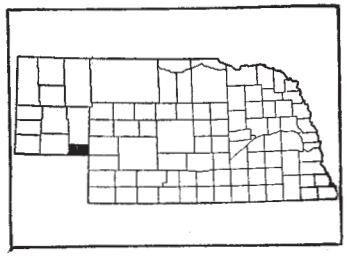

FIG. 27.—Sketch map showing location of the Deuel County area, Nebraska.

Deuel County lies in the physiographic province known as the Great Plains. It is in the western part of this province, in the division known as the High Plains, and embraces sections of the valleys of South Platte River and Lodgepole Creek and the southeastern part of the Cheyenne table-land.

The original surface of the county was a constructional, piedmont alluvial plain whose formations were made up of sediments brought down from the Rocky Mountain region to the west during late Tertiary times.[1] The plain was relatively smooth and sloped gently to the east. During subsequent ages streams of moderate gradient were established, their valleys gradually widened, and small drainage was extended backward into the uplands. Resistant knobs, such as the one just west of the Mount Vernon School and others located elsewhere, indicate that the elevation of the entire surface was originally high and has been reduced by erosion to the present lower lying plain, which is flat to gently undulating and probably similar in topography to the original table-lands.

Within the county the southern half of the plain has been dissected by Lodgepole Creek and almost entirely effaced in the southeastern corner by the South Platte River. The valleys of these streams are sharply defined. Lodgepole Creek and the tributaries of South Platte River extending northward from Colorado into the county have left a spur of table-land, popularly referred to as the south divide, south and southwest of Chappell. The greater part of this table appears as an ancient terrace built up at the confluence of the South Platte River and Lodgepole Creek, the eastern end of the upland plain being located about 3 miles southwest of Perdu School. The soils on this terrace, however, are so old that they are indistinguishable from the upland soil and are therefore classed with the soils of the upland.

[1] Johnson, W. V. The High Plains. U. S. Geol. Surv., 20th and 21st Ann. Repts., 1898–99, 1899–1900.

The larger table, which comprises the greater part of the upland, lies north of Lodgepole Creek and South Platte River. The surface is almost flat to gently rolling, with a few valleys of intermittent streams and a large number of shallow depressions, low gravelly hills, and small mounds. The landscape has a typical prairie aspect, but there is an undulating swell sufficient to insure good drainage. Small, isolated, level-topped hills or buttes and low, rounded knobs, seldom more than 20 to 50 feet above the general level of the surrounding land, break the monotony of the upland plain. These appear to be erosional forms, and their resistance to complete obliteration is due to a capping of local beds of harder rock. The numerous shallow basins or depressions scattered over the table-land are without drainage outlets, the water gathering in the lowest part and escaping by evaporation or slow downward percolation. They lie from 10 to 50 feet below the general level and vary in size from a few acres to several thousand acres. Some of them are in part probably due to solution, while others are largely the result of wind action.

Extending southward and eastward from Garden County and terminating about 4 miles northwest of Big Spring is an isolated ridge of loess material capping the plain. This body lies farther west than any other known area of loess in the State and is a remnant of the former loess plains which at one time extended westward beyond this line. The ridge has the typical characteristics of loess. The small characteristic catstep slips occur along the small drainage ways and the material has the well-known vertical structure and smooth, silty, stone-free character of loess deposits.

The western front of a larger body of loess material, which is continuous in Keith County but pinches out on the spur between the North Platte and the South Platte Valleys to the east, appears in the northeastern corner of the county. Here the drainage ways develop their peculiar loessial character, being shallow but steep-sided draws which in their lower courses tend to break into gullied ravines. Miniature landslides are likewise prominent features, and the slopes in places present a succession of projections known as catsteps, referred to above, caused by the sliding action.

Between these bodies of loess is a large tract of country transitional in character between the High Plains and loess materials. It is almost stone free, with only occasional pebbles of Tertiary materials of the region. Much of the surface is thinly veneered with loess, most of the original deposit having been removed. Since the soils were not distinguishable from the soils derived from deeply weathered Tertiary deposits all the soils of this section were classed with them.

Sloping away from the relatively flat divides toward the valley of Lodgepole Creek are undulating to rolling belts about 2 miles wide traversed by numerous drainage ways or draws. Their upper courses are simply broad, shallow depressions with no definite or continuous channels, but along their lower courses the larger draws have cut sharply into the plain and in some places are bordered by steep slopes. Locally these bluffs are mantled with small bowlders, gravel, and sand and are rugged and barren of soil. Because of their physiographic position and other characteristics they are considered by some as representing remnants of high terraces deposited by the streams in

early periods of erosion and valley filling, though their exact relationship has not been determined. The floors of the small valleys, however, are comparatively wide and nearly level, owing to partial filling with alluvium.

Southeast of Chappell and in the vicinity of Ralton and beyond, a part of the Lodgepole Valley and adjacent upland is covered with sand. Some of these deposits are whipped up into dunes, the sand having been blown from the bed of Lodgepole Creek and other sources. Another body of sandy land lies just east of the loess ridge southeast of Mount Pleasant School.

The terraces of Deuel County are extensive. They occur chiefly along Lodgepole Creek and South Platte River and along the larger draws tributary to these streams. They are of two distinct elevations—the high and low terraces. The high terraces lie high in the uplands or fringe the Lodgepole and South Platte Valleys, but are rather inextensive. Their transition to the bottom lands is marked by abrupt slopes, while that to the upland is more gradual. The surface of the lower terraces is usually level, though in some places it grades gradually from the margin of the flood plain to the base of the upland. The slopes between these terraces and the bottom lands are usually very gentle, except where the streams impinge against them. The bench lands are generally continuous and form rather irregular strips between the first bottoms and uplands.

The bottom lands occur as long narrow strips adjacent to the channels of Lodgepole Creek and South Platte River. They are narrow along the creek, but attain a width of a mile along the river. The surface is prevailingly flat, but along the streams it is somewhat interrupted by minor depressions, cut-offs, overflow channels, and intervening low ridges.

Deuel County has a general elevation varying from 3,600 to 3,900 feet above sea level. The general slope of the plain is southeastward, but the loess ridges stand some 60 feet above the bordering lands. Bench marks of the United States Geological Survey indicate elevations of 3,928, 3,793, and 3,613 feet from west to east on the uplands, 3,697 feet at Chappell, and 3,370 feet at Big Spring.

Lodgepole Creek, cutting the southwestern quarter of the county, drains about 65 square miles of the area. The South Platte River crosses the southeastern quarter, but some of its tributaries, extending northward from Colorado, drain about 25 square miles of the south divide, while part of the precipitation, falling upon the loess plains in the northeastern corner of the county, escapes eastward into Keith County through other tributaries. A large part of the tableland, however, is without established drainage. Much of the rainfall runs off as sheet water and is gathered into small depressions which dot the uplands, whence it escapes only by evaporation or slow seepage. Some of the precipitation on the loess ridges is disposed of in similar basins. In general, the direction of the drainage is eastward, in conformity with the general slope of the upland plain.

The valley of Lodgepole Creek has a length of approximately 16 miles in the county, but the creek channel is much longer on account of its meandering course. The stream has a fall of 142 feet in the county, averaging about 7 feet per mile. The valley is rather deeply

entrenched and lies from 100 to 175 feet below the upland. Its floor varies from three-fourths mile to 1¼ miles in width. The creek has a shallow and very narrow channel and a relatively small flow of water, but is a perennial stream. It winds through a narrow, flat flood plain, which is overflowed at frequent intervals and is bordered by low, smooth terraces standing 10 to 20 feet above the stream. Remnants of high terraces 20 to 40 feet above the first bottom occur in a few places. Most of the draws extending into the valley are dry. Some are fed by springs, but the water generally disappears into the gravelly beds and finds its way to the creek through underground drainage.

The valley of South Platte River is much larger than that of Lodgepole Creek, having an average width of 3 miles. The river in its course of about 9 miles in the county has a fall of 90 feet. However, the channel is shallow and almost dry for a large part of the summer. Many sandy bars in the channel are occupied by willows and scattered cottonwood and are fairly permanent. Much water is diverted for irrigation within the county and in eastern Colorado. Such water as escapes diversion threads its way through channels that branch, combine, and rebranch. The flow is sluggish, except during times of abnormal precipitation, when floods may occur. Little damage can be caused by floods, however, as the land adjoining the stream channel is used exclusively for pasture and hay. The river receives little drainage in its course across the county. Most of its tributaries lose their water by absorption in the loose, porous subsoils of the second bottoms. Remnants of higher terraces occur principally along the south side of the valley.

Part of the alluvial land along both Lodgepole Creek and South Platte River is under irrigation. There has been no extensive development along the creek, the canals being mostly local in function. In the South Platte Valley, however, there are several projects. Two of these take water from the river within the county, while the third has its source in Colorado.

The well-water supply is adequate throughout most of the county. In the valley lands of South Platte River and Lodgepole Creek water is usually obtained in wells from 10 to 40 feet in depth, from the underflow in the alluvial formation. On the table-lands on both sides of the Lodgepole and the South Platte Valleys the water horizon lies at the base of the Ogallala formation, which supplies water for many wells at depths varying from 100 to 300 feet. The volume appears to be large in nearly all localities. In some places water is obtained high up in the formation, but the principal supply is in the basal beds. Along the margin of the tables these waters escape as small springs into many of the drainage ways.

Deuel County was organized in 1888. Its present boundaries were established in 1910, when a part of it was taken to form Garden County. The early settlement was associated with that of its neighboring counties. The greater part of the population came from eastern Nebraska, though a few came from Iowa, Missouri, Illinois, and other States. There are relatively few people of foreign birth, most of the inhabitants being native-born Americans.

The population in 1910 was 1,786 and in 1920 it was 3,282, all classed as rural. The greater part of the population is in the towns in the valleys of Lodgepole Creek and South Platte River. The most densely populated area is in the vicinity of Chappell. Over most of the county where the farm land is uniform the scanty population is evenly distributed.

Chappell, the county seat and principal town, is situated in the valley of Lodgepole Creek, on the main line of the Union Pacific Railroad, about 6 miles southwest of the center of the county. It had a population of 1,131 in 1920. It is a thriving town, characterized by recent rapid growth and substantial buildings. Big Spring, the only other town in the county, is located on the same railroad, but is situated in the South Platte River Valley. It had a population of 408 in 1920. Sidings are located at Ottman, Ralton, and Barton.

The main line of the Union Pacific Railroad enters the area through the valley of South Platte River on the east, dips with the river into Colorado, where it enters Lodgepole Creek Valley and returns to the county, following the valley westward beyond the State line. This is the only railroad in Deuel County, and some parts of the county are 15 to 20 miles from a shipping point.

Most of the wagon roads follow section lines, except the highways in the valleys and a few roads that avoid natural obstructions in eroded areas. The main roads are in fairly good condition, but the less important roads receive very little attention.

There is an abundance of gravel and other road-building material available, the sources being the sand dunes, alluvial fans, and the eroded and weathered surfaces of the formations which make up much of the slope land. The sand varies in texture and purity; usually it is mottled or stained. Some of the sand on the surface of valley slopes is rather pebbly.

The Lincoln Highway enters the county from the east with the railroad but at Big Spring it swings over the divide north and westward to Chappell, where it continues along Lodgepole Creek. The section between Chappell and Lodgepole is well improved and kept in excellent condition. The section from Chappell to Big Spring and beyond was in course of improvement during the progress of this survey.

Deuel County has several rural mail routes, and all important points are reached by telephone. The county has a fairly good rural school system. Good graded schools are maintained in the towns. The county high school is located at Chappell. A consolidated district, maintained jointly with Garden County, includes some territory in the northwestern part of the county. Churches are conveniently located throughout the greater part of the area.

The principal local markets are Chappell and Big Spring. Some products are handled at Lodgepole, Oshkosh, and Lewellen, and in Julesburg, Colo. Wheat is delivered to local elevators in all the towns. Sugar beets are shipped to Grand Island or Brush, Colo. The outside market for cattle and hogs is Denver, while the grain is shipped to Omaha. The local demand absorbs much of the farm produce. Dairy products are marketed in neighboring towns.

CLIMATE.

The climate of Deuel County, which is typical of the High Plains country, is suited to the production of hardy forage crops and certain drought-resistant grain crops, and to livestock farming. There is no Weather Bureau station in this county. The following table, compiled from the records of the Weather Bureau station in Lodgepole, in Cheyenne County, gives the normal monthly, seasonal, and annual precipitation and temperature, which data are fairly representative of climatic conditions in Deuel County:

Normal monthly, seasonal, and annual temperature and precipitation at Lodgepole, Cheyenne County.

(Elevation 3,820 feet.)

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year (1886).	Total amount for the wettest year (1915).
	°F.	°F.	°F.	*Inches.*	*Inches.*	*Inches.*
December	27.4	70	−33	0.59	0.33	0.60
January	25.7	68	−29	.46	.13	1.00
February	26.0	72	−36	.60	.13	.65
Winter	26.4	72	−36	1.65	.59	2.25
March	36.6	85	−15	.89	.59	1.53
April	46.6	92	1	2.47	.64	6.92
May	56.4	98	7	2.64	1.52	6.30
Spring	46.5	98	−15	6.00	2.75	14.75
June	66.4	105	30	2.39	.52	3.42
July	71.8	108	37	2.38	1.64	1.86
August	71.2	107	38	2.04	1.04	2.03
Summer	69.8	108	30	6.81	3.20	7.31
September	62.3	100	20	1.35	.60	2.29
October	50.6	90	0	.82	.40	1.56
November	37.4	84	−22	.34	.16	.20
Fall	50.1	100	−22	2.51	1.16	4.05
Year	48.3	108	−36	16.97	7.70	28.36

The climate of Deuel County is characterized by cold winters and hot summers, with marked extremes in monthly and annual temperature. The mercury frequently rises above 100° F. and often falls to −10° F. The low winter temperatures occur periodically during cold waves and blizzards. The high cold north and northwest winds are often of several days duration. These cold spells and blizzards were formerly very destructive to unsheltered livestock on the open range, but the recent rapid changes toward grain farming and better housing have reduced these losses. The mean annual temperature is 48.3° F. December, January, and February are the colder months, with a mean temperature of 26.4° F. The coldest month is January, with a mean of 25.7° F., but the lowest recorded temperature, −36° F.,

occurred in February. The summer months, June, July, and August, have a mean temperature of 69.8° F. The hottest month is July, with a mean temperature of 71.8° F., and an absolute maximum of 108° F.

The average date of the last killing frost in the spring is May 14, and that of the first in the fall, September 24. The date of the latest killing frost in spring is June 9 and of the earliest in the fall, August 25. There is an average growing season of 133 days. This handicap of a short season is met by cultivating quick-maturing crops.

The distribution of rainfall is important, as the precipitation consists mainly of local showers and is extremely variable. The rains are commonly in the form of thunderstorms and are sometimes torrential, and hail occasionally does serious damage over local areas. Yields are often curtailed by drought; and drought may result in total failure unless, as many farmers of the area believe, summer tillage (fallow with cultivation) is practiced.

The mean annual rainfall is 16.97 inches, of which nearly 80 per cent comes during the growing season, from April to September, inclusive. The driest year on record is 1886, with only 7.70 inches of precipitation, and the wettest year, 1915, with 28.36 inches. The snowfall is light, being considerably less than in the eastern part of the State.

The prevailing wind is from the northwest, except during the summer months, when the winds are usually from the south and southwest. High winds are common throughout the year, but tornadoes are of rare occurrence.

The climate in this region is the principal controlling factor in the agricultural development, as most of the tillable lands are fertile. It restricts in various ways the variety of crops grown and decidedly affects the cultural methods practiced. Owing to the low average rainfall and its variable distribution, the severe winters, and the short growing season, only early-maturing, drought-resistant, and hardy varieties can be profitably grown except under irrigation. Corn occasionally fails to mature, though the growing season is often long enough to mature a number of other crops properly acclimated. Few planted trees thrive unless given much attention, and no natural forest areas whatsoever exist.

AGRICULTURE.

The earliest white settlers came into Deuel County in 1850. They kept inns for the accommodation of those who were passing through to California, Salt Lake, and other western objectives. They were followed by ranchmen, who settled along the South Platte River and Lodgepole Creek following the building of the Union Pacific Railroad in 1867 and 1868, and ranching flourished as long as the range was free. Other settlers were gradually attracted, the greatest influx occurring during 1885 and 1886. The passage of the herd law in 1887 assisted materially in breaking up the large ranch holdings. The first of these later settlers had a few good crops, and immigration as a result continued to increase. After this period of rapid settlement there came, however, a series of dry years, culminating in the disastrous droughts of 1893 and 1894, which resulted in total failure of all crops. The new settlers abandoned the county in large numbers, and the population rapidly decreased. It is probable that

the development would not have been as seriously checked had the dry-farming methods of to-day been understood at that time. Present-day methods of conserving soil moisture by cultivation and the adoption of proper crop varieties have largely overcome the adverse climatic conditions that caused the abandonment of farms during the poor years of the late eighties and early nineties.

The Kincaid Act, which increased the homestead to 640 acres, was passed in 1905 and served to bring additional settlers and to improve general farming conditions. Improved farming operations were put under way. Combined stock raising and farming proved most profitable for that period. Crop production was confined chiefly to forage crops and the necessary subsistence products, or wheat, corn, and vegetables. The sale of butter, milk, and eggs served to meet the living expenses on many farms.

The demands for increased production and the greater perfection of motor machinery resulted in the inauguration of "big" farming in 1915. This type of operation has been steadily promoted, and a large part of the county is being farmed by people from eastern Nebraska whose capital is attracted by the broad, level table-lands and their suitability for cultivation with tractors and other power machinery. Many of these people remain on the land only during the time of harvesting and reseeding, returning to the eastern part of the State as soon as the fall work is finished.

About 54 per cent of the area of Deuel County was included in 262 farms in 1910, with an average size of 575 acres, as reported by the census. In 1920 about 72 per cent of the county was included in 384 farms, averaging 527.8 acres in size. About 84.4 per cent of the land in farms is improved land. The area in cultivated crops more than trebled from 1913 to 1920.

The following table shows the acreage and production of corn, wheat, and other important crops for the years 1909 and 1919, as reported by the Federal Census:

Acreage and production of the leading crops in 1909 and 1919.

Crop.	1909.		1919.	
	Acres.	*Bushels.*	*Acres.*	*Bushels.*
Wheat	7,627	129,346	47,932	938,772
Corn	7,500	169,555	15,948	191,723
Oats	2,697	86,476	2,786	48,877
Barley	381	8,363	1,288	23,856
Rye	1,394	19,727	1,482	22,943
		Tons.		*Tons.*
Alfalfa	1,500	3,853	4,037	6,483
Wild hay	7,265	7,113	4,744	5,686
Coarse forage	175	348	3,108	4,444

The agriculture of the county consists of grain farming and a combined system of grain growing and cattle ranching. A large share of the cultivated level table-land of the south divide and the Cheyenne table is used for grain production. The remaining uplands, the valley of Lodgepole Creek, and the areas of slope and eroded land are used for grazing beef cattle and horses and the production of hay and grain for feed. Large tracts in the valley of the South

Platte River are under irrigation, and here sugar beets and corn are the important crops. A few garden vegetables are produced on every farm for home consumption.

Wheat, the principal cash crop, is the most important grain crop in the county and ranks first in acreage. According to the annual report of the Nebraska Bureau of Markets and Marketing, nearly 95 per cent of the wheat acreage in 1920 was winter wheat, while in 1913 the acreage of spring wheat was slightly greater than that of winter wheat. In 1918, owing to favorable prices, the area devoted to wheat was exceptionally large. Most of the wheat is grown on the heavier soils. On the sandier areas there is considerable danger of drifting by the heavy winds of the spring and fall. Winter wheat is preferred to spring wheat because it ripens early and escapes loss occasioned later in the summer, when conditions are more favorable to rust. The crop is either bound and threshed from the shock or is harvested with the combine, which cuts and threshes at the same time, and returns the straw directly to the ground. A few farmers prefer heading and threshing from the stack. A part of the crop is sold to the flour mill located at Chappell, but the greater part is shipped to outside markets, principally Omaha. Most of the grain is sold through cooperative associations.

The yields are largely dependent on climatic conditions and therefore vary considerably from year to year. However, it is believed by many progressive farmers that summer tillage tends to offset unfavorable climatic effects, one man reporting that he had obtained no less than 28 and as high as 52 bushels by this practice.

The average yield of winter wheat per acre for the last eight years, as computed from the records of the Nebraska State Board of Agriculture, is 24.2 bushels. This fell to 13 bushels in 1918 and reached 30.6 bushels in 1915, a very wet year. The average yield of spring wheat for the same period (1913 to 1920) is much less than that of winter wheat, being only 14.1 bushels. Turkey is the leading variety of winter wheat, though Kanred is popular with some farmers.

Corn ranks second among the grain crops. Warm dry winds and droughts in some years cause considerable damage to the crop. Owing to the high altitude, the shortness of the growing season, and cool nights at critical periods, the kernels are often soft and immature. The early settlers paid no attention to adaptation of varieties to climate and their success was only partial on this account, but hardier, fairly early, acclimated varieties have been introduced and are giving better results. These produce smaller stalks and ears than the varieties grown in the eastern part of the State, but mature more certainly. The seed is generally saved from each crop for the succeeding one, and little attention is given to the finer points of seed selection. Some farmers grow corn successively on the same ground for years with little appreciable decrease in yield, though many alternate with wheat, or alfalfa and wheat to advantage. The corn is fed to hogs, cattle, and horses. On a few farms more corn is grown than is needed and the surplus is sold in the community; but the demand is greater than the supply, and some corn is shipped in from the Corn Belt.

Alfalfa, the principal leguminous crop in the county, occupies third place in acreage. Because of its value for stock feeding, it is one of the most important forage crops produced. The major part of the

crop is grown on the subirrigated bottoms and the irrigated benches of the valleys of Lodgepole Creek and South Platte River. Alfalfa has also been introduced on the uplands, where it appears to thrive under favorable conditions. Rainfall is the controlling factor here. In years of normal rainfall two cuttings are possible on the upland, with a total yield of 2 tons per acre. On the irrigated and subirrigated lowlands the yield is much higher and three cuttings are not unusual. Alfalfa does best in deep, fertile, well-drained soils high in lime.

Oats are not generally considered a profitable crop, but are needed as feed for stock, especially horses, and the crop is valuable in rotations. Oats are grown on most farms, but do not withstand drought well and are frequently damaged by warm, dry winds, droughts at heading time, and grasshoppers. The crop gives best results on the heavier soils. It may follow corn when it is desired to seed the field to wheat the succeeding season. It is rarely grown two successive years on the same land. Yields are very uncertain, but in the best years 40 to 50 bushels are obtained. In the drier years the heads often fail to fill well, and the crop may be suitable only for forage. It is usually cut with the binder and threshed from the shock.

The acreage of wild grasses cut for hay varies from year to year, but the wild-hay crop is relatively less important than it was in 1909. As a source of stock feed it ranks next to alfalfa. The yield averages from less than a ton to 1½ tons per acre, varying greatly in different sections of the county and from year to year. The hay and pasture grasses include stipa or wild grass, sand grass, buffalo grass, bunch grass (little bluestem), grama grass, blackroot (a sedge), western wheat grass, big bluestem, Indian grass, and some marsh grasses. The larger yields are obtained in the valley of the South Platte River, where big bluestem makes a luxuriant growth. In the upland the yields range from one-fourth to three-fourths ton per acre, depending on the rainfall. The greater part of the hay is fed during the winter months to work stock and cattle.

Rye is grown chiefly on the heavier soils and generally for the grain, but it is also grown to some extent for hay and pasturage. The yield varies from 15 to 30 bushels, depending on the rainfall. The crop is drought resistant and yields better upon the sandy soils than wheat. The crop provides excellent early grazing for cattle before the native grasses are fit for use.

Barley is an important feed crop. Yields varying from 30 to 45 bushels have been reported in the last eight years. While the crop is more hardy than oats, it is sometimes damaged by grasshoppers, which clip the heads. Very little of the crop is marketed.

Sugar beets occupied a total area of 313 acres in 1920, as reported by the Nebraska Bureau of Markets and Marketing. They are grown mainly on the irrigated lands of the valley of the South Platte River with a few acres along Lodgepole Creek within the county. The yields range from 10 to 20 tons per acre, with an average of 12 tons. The tops are used locally for stock feed.

Sorghums, millet, emmer, potatoes, and Sudan grass constitute the less important crops. They are grown in small patches on many farms. Sudan grass and the sorghums give good results and could

well be used for forage. Potatoes and garden vegetables are grown for home use; the latter require artificial watering.

There are a few small orchards of apples, cherries, and other fruits scattered over the county; but with the exception of cherries, the fruits are not profitable owing to unfavorable climatic conditions. Late spring frosts prevent the setting of the fruit, and severe winters and droughts injure the trees. Intensive cultivation might produce fair results, but the cost would not be warranted by the profits. As a rule, the orchards receive little attention. Among the small fruits, strawberries and gooseberries do well.

The raising and feeding of livestock, combined with grain farming, is an important industry in parts of the county. This is particularly true of those farms that include areas of land unsuited for cultivation, such as the slope lands adjacent to the valleys. The smooth tables are devoted almost entirely to grain production and the maintenance of work stock and some dairy and beef cattle. In January, 1920, according to the census, there were 3,458 horses, 192 mules, 6,340 cattle, 6,636 hogs, 615 sheep, and 2,548 dozen fowls in the county.

Most of the cattle produced are shipped as stockers and feeders to Omaha. Some are handled cooperatively, enabling the small farmer to sell more profitably. They are comparatively free of disease. As a rule, pasturage on dead grasses during the winter has been supplanted by feeding during the severe seasons. The most popular breeds are grades of Hereford and Shorthorn. Very few of the animals are purebred, but the herds are usually headed by well-bred bulls, a practice which has improved the quality of the stock generally in recent years. The stock is usually sold in the fall when 2 or 3 years old. There are several dairy herds consisting only of grades. The dairy products are marketed locally, Chappell being supplied by two herds. As in other western counties, the dairy industry has proved a valuable adjunct where it has been undertaken. The use of purebred herds would materially increase the returns.

Hogs are raised on a small scale on many farms, but the low prices have recently somewhat discouraged those engaged in the industry. The animals are generally fattened on corn or fed alfalfa on the irrigated and subirrigated farms and some of the upland farms.

A small flock of poultry is raised on nearly every farm, but few farmers have a surplus of poultry products for sale. Small numbers of turkeys, geese, and ducks are raised, as well as chickens.

In general, the horses raised on the divides are of poor grade, while those in the valleys and sugar-beet sections are good. Those on the divides are used only in season and stand idle the rest of the year. They are not of a heavy draft type, weighing from 1,000 to 1,200 pounds. Belgian and Percheron grades are considered the best for local use.

Sparse growths of black willow, western red cedar, sandbar willow, almond-leaf willow, cottonwood, white elm, hackberry, wild plum, red ash, green ash, and boxelder grow along the larger streams. The valley of Lodgepole Creek has few native trees. The valley of South Platte River supports mainly willows and cottonwoods. The uplands are sparingly dotted with timber claims of ash, boxelder, and other species, but owing to unfavorable climatic conditions the trees have a small, stubby growth.

The Russian thistle and dwarf sunflower are abundant, and other noxious weeds are widely distributed over the county. The locust, or grasshopper, and the variegated cutworm are occasional pests. Wheat rust and corn smut do some injury.

Topography and soil conditions have largely influenced the extent and distribution of the farmed areas and have affected more or less the distribution of the various crops. Experience has shown that the heavier, more level soils of the high table-lands are well adapted to the production of grain crops and potatoes, while the alluvial soils of the terraces and first bottoms along the larger streams produce the highest yields of alfalfa and native hay. Little wheat is raised on the subirrigated bottoms or the sandy soils of the valley lands, corn being the principal crop. Sugar beets are produced only under irrigation. In general, the heavier and deeper soils are recognized as best adapted to the small grains. These include the very fine sandy loam, loam, and silt loam. In the irrigated areas the finer textured soils with the deepest and least pervious subsoils, rather than those with coarse sandy or gravelly layers within the 3-foot section, are selected for the special crops. The areas of eroded stony lands, the sand dunes, and the large areas in which the underlying rock lies close to the surface are best adapted to grazing. The poorly drained flood plains along Lodgepole Creek and the South Platte River are used exclusively for hay and pasture, and the better drained areas of the first bottoms are well adapted to alfalfa. Corn is grown in all parts of the county, but appears to do best on the lighter textured soils. Fields on northern slopes are considered better for corn and on southern slopes for wheat, but the matter of situation is disregarded by most farmers. In dry seasons corn and other crops produce better yields on the rounded slopes and valley sides than on the flat uplands.

Owing to the low rainfall and its variable distribution from year to year, certain cultural methods not practiced in the more humid parts of the State are necessary to success. On the irrigated lands approved dry-farming methods are uniformly carried out. The essential features are thorough preparation of the land and the conservation of soil moisture. The sandy lands are not plowed deeply and are not cultivated so intensively to form a mulch as the heavier soils. Soils which blow readily are not summer tilled, as high winds cause the soil to drift. It is the aim to cultivate after a rain heavy enough to destroy the mulch, and during periods of prolonged drought it is often necessary to cultivate more than once between rains. Frequent cultivation is especially urged for thorough and proper summer tillage. A rather rough surface is advantageous on the heavy soils, as it prevents sheet water from running off during heavy rains. The heavier soils, once they are saturated, hold more moisture than the sandy types, but the loss in run-off and the slow movement of water through the soils offset this advantage, and under the prevailing climatic conditions certain crops, such as corn, are more dependable on the lighter soils. Moisture conditions are the chief factor controlling cropping and rotation; fertilization and tillage methods are of secondary importance.

As a rule, the ground for small grain is not plowed in the fall, though progressive farmers are increasing their yields 4 bushels per acre by following this practice. New land is plowed for small grain either

with heavy teams or more commonly with mechancial power. It is usually broken to a depth of 3 or 4 inches, with a gang moldboard plow drawn by a tractor, and then is double disked and packed to fill up all the furrow slices. The grain is sown with a drill. Often the disking and drilling are done in one operation with a large tractor. The sod is generally broken in May or June in order that the soil may absorb and store the summer rains; if broken later it does not produce well the following year. Old land is plowed every two or three years. When small grain follows small grain, the stubble ground is generally disked and sown with a press drill. Wheat is often sown between the rows of standing corn in the fall.

Summer tillage is rapidly gaining favor among many of the farmers. The chief objection to it is the difficulty of practicing diversified farming, as the corn and the land in summer fallow require cultivation at the same time. Where summer tillage is neglected, weeds soon spring up drawing on the moisture supply necessary for the succeeding crop. When summer tillage alone is practiced, the ground is plowed in the fall and disked at necessary intervals during the summer to keep down the weeds. The crop is drilled in the succeeding fall. A few farmers list the ground in the fall, split the listed rows in the summer, and level the ground with a cultivator before drilling in wheat. A considerable part of the land in the county is new, and on this wheat is grown in successive years. It is considered difficult to practice a regular rotation on account of the variable climatic conditions. In 1920 much wheat was sown on sod land. It is generally sown before September 1, although some seeding is done through October. The grain is harvested with the binder, header, or combine. It is threshed from the shock or stack, but owing to the large wheat acreage, threshing is not completed until very late in the fall. The grain is either marketed from the machine or stored for more favorable prices. Scarcity of labor has induced many farmers to invest in combined harvesters and threshers for gathering the crop. It remains to be seen how successfully these can be operated over a number of years. Reports indicate that considerable savings were realized on tracts of 160 to 230 acres.

Corn land is plowed in the fall or disked early in the spring. The corn is planted from May 10 to May 30. Some is listed, as it is thought to withstand the drought better when planted in this way. The farmers appear to be divided in choice between listing and plowing, with surface planting. The planted corn produces a bigger stalk and more fodder. The crop is cultivated two or three times, and harvest begins late in September. Occasionally short growing seasons result in large quantities of soft corn. Silos would prevent much loss in such seasons. The crop is attacked by smut, cutworms, and grasshoppers.

Alfalfa and sugar beets are the important crops produced under irrigation, corn and wheat being of secondary importance. Sugar beets are planted during May or early June on ground that has been previously plowed and well pulverized. From 15 to 20 pounds of seed per acre is used, and the seed is planted by a special machine which marks the rows 18 to 22 inches apart, excavates the furrow, and drops the seed at regular intervals. After two or three leaves appear the

field is blocked and thinned with special knives. All seedlings except the hardiest are removed and weeds are pulled at the same time. The number of waterings depends entirely upon the soil and the season. Harvesting, which begins about October 1, consists of lifting, pulling, topping, and piling the crop. The beets then are hauled to the dump, screened, and shipped in open cars, or siloed if it is not possible to haul them at once.

Farm improvements on the whole are good, and practically all farms are equipped with some modern labor-saving machinery. The buildings, as a rule, are well constructed, the great influx of people from the eastern part of the State in recent years and the general prosperity having resulted in an increase of substantial structures. Portable bunk houses are a feature on sod-land farms. On many farms, the equipment consists entirely of tractors and tractor implements suited for farming on an extensive scale. Other farmers use the tractor only for heavy work, and use horses for general work. The tractor is by some considered unprofitable on the small farm. On the divides, the horses are light to medium weight, the tractor and automobile having decreased the demand for heavy and light animals, respectively. In 1920 there were 662 automobiles and 123 tractors in the county.

No commercial fertilizers are used and little of the manure produced on farms is applied to the land. A few manure spreaders are in use, but owing to the newness of the land the maintenance of fertility is given little attention.

Efficient farm labor is rather scarce, but usually there is sufficient help available during harvest seasons. Much of the farm labor is performed by the farmer and his family, except during harvest. Most of the farm laborers are American, but there are a few Germans and Russians. Few men are hired by the year. Day laborers receive 50 cents to 70 cents an hour and board, those operating tractors commanding the higher wage. Some farmers and ranch owners employ entire families, giving them in addition to the wages the use of a house, garden, cows, and chickens. Contract labor is employed in growing sugar beets.

The majority of the farmers and ranchers own their land. However, the proportion of farms operated by owners decreased from 69.8 per cent in 1910 to 61.7 per cent in 1920. Most of the tenant farms are operated on shares, the owner receiving one-third of the crop delivered at the elevator, the tenant furnishing seed, labor, and equipment.

On account of the newness of the county it is difficult to determine land values accurately. The valuations given are based on estimates of farmers. The best grades of upland in the southwestern corner and the Cheyenne table range in value from $60 to $100 an acre, depending chiefly on the location and improvements. The sand-hill areas vary from $10 to $15 an acre, but these are generally sold in conjunction with neighboring areas. The terrace and first-bottom lands in the valleys of Lodgepole Creek and the South Platte River that are adapted to irrigation, have sold as high as $125 to $250 an acre. The rough, broken areas adjacent to the stream valleys sell for $12 to $17 an acre.

SOILS.

The formation of the soils of Deuel County has been greatly affected by the subhumid climatic conditions characteristic of the region. The total rainfall is too low to produce a luxuriant vegetative growth and permit the accumulation of such a large amount of organic matter as occurs in the soils a short distance to the east. The rainfall is also inadequate to cause the leaching of the entire soil layer. Lime occurs sparingly in the surface soil, but is abundant in the subsoil.

The well-drained soils of the upland have reached a stage of maturity and are uniform in character. They are typically brown soils, with a lighter colored compact subsurface layer and whitish highly calcareous subsoils. In general, the upland of the county may be considered as covered with a single group of closely related soils that differ in (1) the fineness or coarseness of the material, (2) the extent and depth of weathering and erosion, and (3) in texture and compactness of the subsoil. The remaining soils of the county, occupying the slopes, eroded escarpments, and valley floors, differ from the upland soils mainly in location, topography, and derivation.

Outside of the soils of the basin areas and the loess deposits, the upland soils of the county have been derived almost entirely from a single geologic formation, the Ogallala. The material is of late Tertiary age and consists of an impure calcareous grit or sand cemented with lime. The formation is strikingly nonuniform in character, containing interbedded deposits of clay, sand, gravel, and lime in no apparent order. At its base there are often beds of conglomerate. Throughout its mass there are scattered pebbles of crystalline rocks from the Rocky Mountains, streaks of pebbles and sand, and thin ledges of sandstone. The harder calcareous beds are of white or cream color, and outcrop in irregular cliffs. Some of these give rise to low rounded knobs on the uplands. The formation has a relatively level surface. Its thickness in this region varies from 150 to 300 feet, but as the surface has been more or less eroded, the original thickness is unknown. When the rock disintegrates on the surface an accumulation of silt, sand, and scattered pebbles remains, constituting a soil of varying depth. Among the minerals are free quartz and orthoclase. The pebbles are composed of feldspar, mica, hornblende, granite, syenite, gneiss, rhyolite, basalt, hornblendic schist, and quartzite. The name Mortar Beds has been applied to this conglomeritic rock.

The loess deposit lies unconformably over the eroded surface of the Ogallala formation. It occurs in this county in two bodies, an isolated ridge and a margin of more extensive tables to the east. The deposit formerly extended beyond its present western limits as a smooth upland plain. The material consists of a buff-colored silt with small quantities of clay, very fine sand, and fine sand. Locally it is often called "yellow clay," though the percentage of clay is relatively small. The material is remarkably uniform in texture, and a weak cementation with calcium carbonate and finely disseminated iron oxide gives it a peculiar ver-

tical structure and massive appearance. In an undisturbed deposit the material is coherent, but it reduces readily into a loose, silty powder. In places accumulations of particles of white carbonate of lime give it a splotched appearance, while in other places there are pockets of sand. Under the influence of soil-forming agencies, the loess has given rise to soils differing markedly from one another in different parts of the State. In Deuel County these agencies have produced the Keith and the Colby series.

Sand dunes are developed along the lower course of Lodgepole Creek and the adjacent uplands southeast of Chappell. Most of this sand appears to have been blown from Lodgepole Creek. The sand has been whipped into ridges and hills, with intersecting valleys and basins of various sizes.

The alluvial or stream-deposited soils occupy the high terraces, low terraces, and poorly drained flood plains. The materials laid down in the valley of Lodgepole Creek consist of fine sand and silt overlying gravel derived from the Ogallala formation. The valleys of the larger draws have been partly filled by relatively coarser alluvial wash to a depth of 5 to 15 feet. Small deposits of alluvial-fan material are spread out at the mouths of the draws entering Lodgepole Creek Valley, and considerable recent-alluvial material occurs at the base of practically all the steeper slopes.

Bordering Lodgepole Creek and South Platte River Valleys are remnants of land forms which appear to be very ancient terraces. The areas are mere patches of gravel and benchlike remnants which have lost their original constructional surface through erosion. Their position and content suggests that they were among the earliest alluvial deposits laid down by the major drainage ways, although the bodies extend into the table-land for great distances along minor draws, as Walrath Draw and others.

The soils of the first bottoms or flood plains are of recent origin and in many places are still in the process of formation. The deposits are mainly sand and silt, with which are associated locally beds of clay. They comprise materials washed down from the adjacent uplands and from the more elevated regions to the west, and occur along both sides of Lodgepole Creek and South Platte River.

In the scheme of classification the soils are grouped into series on the basis of similarity in color, structure, origin, mode of formation, topography, and drainage. Each series consists of soil types, the type being determined by texture, which depends upon the relative percentage of the various-sized particles of which it is composed. The soil type is the unit of soil mapping.

The soils of Deuel County are broadly separated on the basis of derivation into the following groups: (1) Residual soils, (2) soils derived chiefly from wind-laid deposits, (3) soils derived from stream-laid terrace deposits, (4) soils derived from recent-alluvial or flood-plain deposits, (5) miscellaneous soils. The soils of the first group belong in the Rosebud, Canyon, and Dawes series. The Keith and Colby series have been derived from loess and represent an advanced stage of weathering of this material. The soils of the Valentine series and Dunesand belong to the recent wind-laid deposits. The terrace soils are correlated with the Cheyenne, Tripp, Bridgeport, and Yale

series, and the recent-alluvial soils with the Scott, Laurel, Cass, and Sarpy series.

The Rosebud series includes types with dark-gray to brown, moderately calcareous surface soils, and a highly calcareous, whitish, floury subsoil. A characteristic feature is the light-gray to almost white color of the deeper subsoil. The Rosebud soils are derived from the light-colored, calcareous, Tertiary rock of the High Plains, and mainly from the Ogallala formation. The topography ranges from gently undulating to very hilly and steeply rolling. The more hilly areas are dotted with white exposures of the underlying formation. Angular and waterworn gravel occur abundantly in the subsoil and locally in the soil. The Rosebud loam, silt loam, and fine sandy loam, each with a deep phase, and the Rosebud gravelly sandy loam are mapped in Deuel County.

The surface soils of the Canyon series are brown to grayish brown and average 6 to 8 inches in depth. The subsoil is yellowish gray. Both soil and subsoil contain fragments of partly disintegrated, soft, calcareous conglomerate of the Tertiary Mortar Beds. The types are derived mainly from the calcareous conglomerate, sand, and silt, of Tertiary age. They occupy rounded hills and ridges whose lower slopes in places are sharply eroded and precipitous. The series differs from the Rosebud series in having the calcareous Mortar Beds instead of the white lime accumulation in the subsoil. In Deuel County the Canyon series is represented by the silt loam and gravelly sandy loam.

The surface soils of types of the Dawes series are grayish brown, brown, or dark brown. The upper subsoil is usually brown to dark brown, with a moderately friable and compact structure and a heavier texture than the surface soil. Below depths of 20 to 30 inches the subsoil consists of light-gray, highly calcareous, silty material, which is chalklike when dry—the whitish, floury, material encountered in the Rosebud subsoil. A marked feature of the Dawes series is the removal by weathering of nearly all the lime from the surface soil and upper subsoil and its concentration in the lower subsoil. The soils of the Dawes series characteristically occur in basinlike depressions and valleylike areas of the upland or on the high parts of the nearly level and less eroded table-lands. The silt loam is mapped in this county.

The surface soil of the Keith series to an average depth of about 12 inches consists of grayish-brown, or dark grayish brown, loose, fine granular material. A slight change to a grayish-brown color and a heavier texture takes place with depth, and the structure becomes somewhat compact. At about 30 inches this passes abruptly into grayish-white or light grayish yellow friable material. The carbonates have been largely leached out of the two upper layers, but the lowest has a high concentration of lime and other carbonates. This series has a profile similar to that of the Rosebud series and differs principally in the origin of its parent material; the Keith having been derived from loess and the Rosebud from the older rocks. One type, the silt loam, is mapped in Deuel County.

The types of the Colby series have ashy-gray to brownish-gray surface soils which grade abruptly into a light-yellowish or whitish, floury, highly calcareous subsoil. They are derived from loess and

have an open structure. The topography varies from gently to sharply rolling. The drainage is good. The material in the surface layer has been considerably weathered and slightly modified by wind action. Only the silt loam is encountered in this survey.

The soils of the Valentine series are characterized by brown to dark grayish brown surface soils, a brown to dark-brown upper subsoil and a light-brown to yellowish-brown lower subsoil. The subsoil is friable and only moderately compact, grading at depths of 2 to 3 feet into loose sand. A characteristic feature is the absence of calcareous material. The Valentine soils occupy level to gently rolling valleys and basins where their position has favored the accumulation of organic matter. The material probably includes particles carried down by Lodgepole Creek and partly weathered wind-blown material derived originally from the underlying Tertiary sandstone. The material has been shifted by wind and water. These soils differ from the Rosebud soils in the absence of a light-colored subsoil and in their lower lime content. In this county, the Valentine fine sandy loam and the loamy fine sand are mapped.

Areas mapped as Dunesand include grass-covered sand hills and ridges, composed almost entirely of gray sand.

The soils of the Cheyenne series are derived from alluvial deposits which have partly filled the valleys of streams and draws in the western part of the Great Plains region. The soils are brown, with a lighter brown or yellow subsoil which is underlain at various depths by a substratum of porous sand and gravel. The subsoil is calcareous and in places the surface soil contains some lime. The surface layer locally contains much small gravel, and the subsoil is gravelly and porous. The Cheyenne soils are well drained and lie mainly above overflow. They occupy the low and high terraces along Lodgepole Creek and South Platte River and their tributaries and the flood plains along the smaller streams. In this survey the loam, fine sandy loam, and gravelly sandy loam are mapped.

The surface soils of the Tripp series are brown to light gray, with a dark ashy gray appearance in places at the surface. The subsoil is light gray to white. Both surface soil and subsoil have a high lime content. The substratum consists largely of gray, stratified, highly calcareous fine sand and silt, with a relatively small proportion of coarse sand and fine gravel. The soils are mainly of alluvial origin and occupy terraces or bench lands along streams above the reach of floods. In places the material has received some admixture of wind-laid material subsequent to its deposition or has been modified by colluvial wash. The topography is comparatively level but drainage is fairly well established. The Tripp very fine sandy loam and silt loam are mapped in this county.

The Bridgeport series includes types with brown to grayish-brown surface soils underlain in places by a subsoil light in color, though more commonly there is no change in the 3-foot section. Locally the lower subsoil is somewhat calcareous. The Bridgeport soils differ from the Valentine soils in their higher lime content, and from the Tripp soils in the absence of the white, floury, calcareous layer in the lower subsoil. Drainage is everywhere good. The series is derived from recent-alluvial and colluvial material. In the uplands are depressional areas whose soils are identical with the Bridgeport. The mate-

rials have been transported by sheet waters from the surrounding higher lying areas into large basins which have little or no outlet. These are mapped as a basin phase. In this county, the Bridgeport fine sandy loam, loam, and silt loam and basin phase of the silt loam are mapped.

The surface soils of the Yale series are brown to light brown. The upper subsoil is a light-brown compact silt loam having a hardpan-like structure, and ranging in thickness from 8 to 12 inches. The lower subsoil is a light-gray or light yellowish brown floury silt loam. The soil and upper subsoil are low in lime, but the lower subsoil has a high lime content. The soils occupy old terraces above overflow. The surface is flat, but as the rainfall is low, drainage is adequate. This series differs from the Tripp only in the compact structure of the upper subsoil. It is represented in this area by the silt loam and by a basin phase and a heavy phase of the silt loam.

The surface soils of the Scott series are dark brown to almost black and heavy and refractory. The subsoil is a dull-brown to black silty clay grading into a stiff, heavy, compact, almost black clay. It is sticky and plastic when moist, but hard and brittle when dry. In the loess region the subsoil generally grades into light-yellow or ashy-gray silt loam similar to the subsoil of the Keith and Colby series. Both soil and subsoil have a bluish-gray cast when thoroughly dry. The series is derived from material washed from the higher lying soils by sheet water and deposited in temporary ponds occupying shallow undrained depressions in the upland. The silty clay is the only member of the Scott series mapped in the county.

The surface soils of the Laurel series are light gray to gray or light grayish brown. The subsoils are light gray to brown and highly calcareous. In places the lower subsoil is almost white. As a rule the internal drainage is good but the surface drainage of the heavier types may be deficient. The Laurel soils are alluvial and occupy the flood plains of Lodgepole Creek and South Platte River and some of their tributaries. They consist of sediments brought down from high-lying regions to the west or accumulated through local erosion with admixture of wind-laid material in places. The series is represented in this county by the very fine sandy loam and silt loam types.

The Cass soils consist of alluvium deposited by South Platte River and Lodgepole Creek. They are dark brown to dark gray in color in the surface soil and have a brownish-gray to gray porous subsoil. They occupy the first bottoms adjacent to the stream channels, and because of their low topographic position drainage is somewhat deficient in some members of the series. The fine sandy loam, very fine sandy loam and silt loam are mapped in Deuel County.

The Sarpy series differs from the Cass only in the lighter color of the surface soil. Only one type of the Sarpy series, the very fine sandy loam, has been mapped in this area.

In the following pages of this report the various soils of the county are described in detail and their relation to agriculture is discussed. The distribution of the various soils is shown on the soil map accompanying this report. The table following gives the name and the actual and proportionate extent of each soil type:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Rosebud silt loam	68,224	37.4	Valentine fine sandy loam	3,136	1.1
Deep phase	36,800		Cass silt loam	2,752	1.0
Dawes silt loam	37,568	13.4	Canyon silt loam	2,432	.9
Rosebud gravelly sandy loam	27,456	9.8	Laurel very fine sandy loam	2,432	.9
Rosebud loam	25,728	9.7	Valentine loamy fine sand	2,304	.8
Deep phase	1,472		Bridgeport loam	2,304	.8
Cheyenne gravelly sandy loam	9,920	3.5	Scott silty clay	2,112	.7
Tripp silt loam	8,768	3.1	Bridgeport fine sandy loam	1,984	.7
Bridgeport silt loam	5,440	3.0	Cheyenne fine sandy loam	1,600	.6
Basin phase	3,200		Dunesand	1,600	.6
Colby silt loam	8,448	3.0	Cass fine sandy loam	1,472	.5
Yale silt loam	4,288	2.8	Canyon gravelly sandy loam	1,216	.4
Basin phase	3,328		Tripp very fine sandy loam	1,152	.4
Heavy phase	256		Cass very fine sandy loam	1,152	.4
Keith silt loam	3,840	1.4	Laurel silt loam	1,024	.4
Cheyenne loam	3,392	1.2	Sarpy very fine sandy loam	768	.3
Rosebud fine sandy loam	2,112	1.2			
Deep phase	1,280		Total	280,960	

ROSEBUD GRAVELLY SANDY LOAM.

The Rosebud gravelly sandy loam, as mapped in this area, consists of brown to light grayish brown, loose gravelly sandy loam, with patches of gravel, gravelly sand, and gravelly loam. There is very little textural difference between the soil and subsoil, though the latter becomes yellowish and lighter in color with depth and in places is slightly calcareous. The gravel varies in size from small pebbles to stones 3 or 4 inches in diameter. Granitic material is of commonest occurrence. All the fragments are waterworn.

The type occurs in all parts of the county adjacent to the valleys of Lodgepole Creek and South Platte River and some of the larger drainage ways, except in the loess regions. It occupies the gravel-covered hills and ridges scattered over the slopes from the uplands to the terraces and occurs around the heads of streams and along the valley walls. Typical areas border both Lodgepole and South Creek Valleys for long distances, and small areas are mapped along all the tributaries emptying into these streams.

The type appears to represent remnants of a much older and higher terrace than any mapped along the drainage ways, deposited when the major streams were flowing at much higher levels than at present. The presence of bodies extending for great distances up the tributary draws into the Cheyenne table, as along Walrath Draw in this county, is not fully understood, however. The former position of these channels appears to have been marked by shallow deposits of sand, gravel, and waterworn bowlders, which capped the tops of hills and ridges at a common level. The formations underlying those parts that were not protected by a gravel deposit have been eroded leaving the protected parts as ridges and hills.

The Rosebud gravelly sandy loam has very little agricultural value. It is porous and unretentive of moisture, and has an unfavorable topography. Where the deposits of gravel are thin, some grasses have obtained a foothold, affording fair pasturage, but a greater acreage per head is required for grazing cattle than on soils

of heavier texture. The type furnishes sand and gravel for building construction and road making.

The selling price varies from $12 to $17 an acre, averaging about $14. The land is generally sold in conjunction with neighboring soils and tends to reduce the value of farms in which it occurs.

ROSEBUD FINE SANDY LOAM.

The surface soil of the Rosebud fine sandy loam is a brown to grayish-brown fine sandy loam with an average depth of about 12 inches. It contains a high percentage of fine and very fine sand and has a friable structure, but the presence of a small quantity of clay gives the soil sufficient adhesiveness to retard removal by the wind. The subsoil is a lighter colored fine sandy loam of loose structure, which in places is slightly more compact than the surface soil. Below 24 or 27 inches the material is coarser, more friable, grayish in color, and calcareous. The upper subsoil is generally leached of lime, but the lower subsoil effervesces freely with acid.

The type varies somewhat. Some small areas of very fine sandy loam have been included with this type. Fragments of the Ogallala bedrock are encountered locally in the lower part of the 3-foot section. In many places on the slopes the loose sand has been washed or blown away and the white calcareous material exposed.

The Rosebud fine sandy loam is mapped in scattered areas on both the north and south table-lands. The areas are irregular in shape and are closely associated with other types of the series. The topography is characterized by slopes and moderately rolling hills and low ridges. The material has been derived from weathered sandstone of late Tertiary age. The high sand content is probably in part the result of the removal of the finer particles in the process of weathering and to drifting. Drainage is everywhere thorough and in a few places excessive, owing to the loose, porous nature of the soil and subsoil.

The type is of small extent and very little of it is under cultivation. It is used chiefly for grazing cattle. The native vegetation consists of wire grass, buffalo grass, redfieldia, and stipa. About 10 acres are required to support each steer grazed. The cultivated crops are corn, wheat, rye, sorghum, millet, Sudan grass, and alfalfa. Wheat and alfalfa, however, make a sparse growth. Corn yields from 15 to 25 bushels per acre; wheat 10 to 12 bushels; rye, which is a rather sure crop, 12 to 15 bushels. The forage crops yield a fair tonnage of roughage.

The type is friable and easy to till. Cultural methods designed to protect small grain from injury should include the use of manure, which helps to prevent wind erosion.

Land of the Rosebud fine sandy loam sells for $15 to $30 an acre, depending upon improvements.

Rosebud fine sandy loam, deep phase.—The deep phase of the Rosebud fine sandy loam differs from the typical soil in having a surface soil of greater depth and coherency. The loose, sandy subsoil material is not encountered above depths of 20 or 30 inches, consequently the surface soil has a more favorable structure and a greater capacity

for retaining moisture. Small areas having a very fine sandy loam texture have been included with this phase.

ROSEBUD LOAM.

The Rosebud loam consists of 8 to 15 inches of brown, friable, mellow loam, which is slightly darker in color in the first 2 or 3 inches. The upper subsoil is a brown to grayish-brown friable loam or fine sandy loam. This passes rather abruptly at a depth of 18 to 24 inches into a gray, sandy and silty product of the partly disintegrated Ogallala formation. The upper subsoil is moderately compact, though in places it is of lighter texture, but the lower part is loose and floury. Small rounded feldspathic and quartzitic gravel is present in the subsoil, and varying but small quantitites of similar gravel are generally strewn over the surface. The lower subsoil is highly calcareous and the intermediate sandier layers have a moderate lime content, but the surface soil seldom reacts with acid.

The depth of the soil varies over the county. In places the heavier upper subsoil layer is lacking, and a rather abrupt change from the brownish top soil to the lighter colored, highly calcareous subsoil is characteristic. In many areas both surface soil and subsoil contain much coarse sand and waterworn gravel, together with limestone fragments and lime concretions. Locally these are present in such quantity as to form patches of gravelly loam or sandy loam. Where the material of the lower subsoil lies near the surface or is exposed, as on hillsides, small knobs, or slopes to drainage ways, the surface color is grayish or white. Disregarding local variations, however, the Rosebud loam retains its essential features over extensive areas.

The Rosebud loam occurs in scattered areas of varying size throughout the upland. The largest bodies are associated with the heads of drainage ways, where erosion has developed the type by removing the finer particles of the silt loam.

The topography is level to rolling and in places hilly. Some areas occupy smooth, gently undulating uplands, but the majority are rolling and hilly and lie on the eroded slopes along streams.

All the type has good surface and internal drainage, and owing to the porous subsoil and substratum the drainage is excessive in places. Much of the soil is drained by intermittent streams, but where channels are not established the slope is usually sufficient to drain all surplus water.

About 40 per cent of the type is under cultivation and the remainder used for pasture and hay. The native vegetation consists chiefly of buffalo grass, grama grass, and wire grass, with some western wheat grass in the more level areas. Wire grass, the characteristic grass of the type, is conspicuous in the areas devoted to pasture, particularly where the surface is strewn with gravel. The relative abundance of this grass serves as an aid in distinguishing the Rosebud loam from the other types of the series. From 8 to 10 acres is required to pasture a cow or steer throughout the year. Beef cattle are raised almost exclusively, but many farmers own a few milk cows and sell surplus dairy products. Some farms have a small herd of horses. Most of the cattle are shipped as stockers and feeders. Some cattle are handled cooperatively and yield the small rancher larger profits.

Wheat is the most important cultivated crop. It is the chief cash crop and occupies the largest acreage. Winter wheat is grown more extensively than spring wheat, Turkey being the principal variety. Kanred is increasing in favor with some farmers. Under dry-farming conditions wheat averages 10 to 12 bushels per acre over a series of years. Higher yields are obtained under summer tillage methods. Corn, oats, and rye rank in acreage in the order named. Corn yields from 10 to 25 bushels per acre, but the average yield is 12 to 15 bushels, and frequently the crop fails to mature properly. Rye yields 12 to 15 bushels. Oats yield 10 to 35 bushels, but the crop does not always succeed as it is sometimes injured by warm, dry winds or drought. These crops are fed to work stock and cattle. Only the earliest maturing varieties are grown, on account of the shortness of the growing season. Other crops include millet, which yields from 1 to 2 tons per acre; Sudan grass, which yields 2 to 5 tons per acre; potatoes, alfalfa, and barley. Potatoes are generally consumed on the farms where produced. Some alfalfa is grown, but the crop does not thrive on this soil, probably on account of insufficient moisture supply. Several cuttings are obtained in good years. Millet and sorghum are grown on a few farms for winter feed, these crops seldom failing to furnish forage. The yields of all crops show variations from year to year, rainfall being the controlling factor.

The sod land is usually broken to a depth of 3 or 4 inches, and as soon as possible thereafter it is disked and harrowed to prevent as far as practicable loss of moisture. A slightly rough or lumpy condition is maintained to prevent drifting. The soil is mellow and easily handled under favorable moisture conditions, but during periods of prolonged drought it becomes more compact, so that plowing and the preparation of a good seed bed are more difficult. Old land is plowed every two or three years, but is well disked each year before seeding to grain. Most of the corn is listed, though some is surface planted. Small grain is planted with a press drill. Wheat, millet, and sorghum thrive better on sod land, while corn and oats are better adapted to old ground. Oats do better on land previously in corn, while millet does best on land that is plowed just before seeding, instead of being disked, on account of more thorough weed destruction. Many tractors are in use on the type, and sometimes the plowing, disking, and seeding are done in one operation.

The sale value of land of this type ranges from $50 to $85 an acre, depending upon improvements and nearness to shipping points.

Conservation of soil moisture is most important in farming this type. This requires careful attention, as the type is rather droughty, owing to the open structure of the subsoil. The type yields well in wet years, but in general the results would be better if more thorough tillage were practiced, even though this entails decreased cultivated acreage. Intertilled crops require frequent cultivation to maintain a loose mulch. The rolling and hilly areas near to drainage channels should be protected from erosion.

Rosebud loam, deep phase.—The deep phase of the Rosebud loam occurs on the flat table-land both north and south of Lodgepole Creek and South Platte River. It has a small total area and occurs in widely scattered bodies. In color, structure, and texture of soil and subsoil it is identical with the typical Rosebud loam, and differs

only in the thickness of the surface soil and upper subsoil. The characteristic white, floury, calcareous material of the typical soil is seldom encountered above 30 inches. The phase is preferred to the typical soil on account of its flatter topography and greater moisture-holding capacity.

ROSEBUD SILT LOAM.

The upper soil of the Rosebud silt loam consists of 3 or 4 inches of rather dark brown or dark grayish brown mellow loam, passing into brown or grayish-brown, friable silt loam of rather compact structure, extending to an average depth of about 10 inches. In places the surface soil is underlain by a thin layer of darker brown, sticky material, with a heavy silt loam or light silty clay loam texture. The change from either the surface layers or the sticky intermediate zone to the subsoil is abrupt. The subsoil is a yellow, grayish-yellow, almost white floury silt loam or nearly pure silt, which has been derived from the underlying Ogallala formation.

The dark layer of the upper subsoil is slightly compact when undisturbed, but is easily reduced to loose friable material. The surface soil has a moderate lime content; the subsoil is calcareous throughout and the white material forming the lower part is largely composed of lime. Fragments of limestone or calcareous sandstone are encountered here and there in the lower subsoil, and the surface is thinly strewn in places with fine gravel, composed of pinkish feldspar, granite, and other rocks.

The Rosebud silt loam is rather variable, there being no large areas of uniform texture. The type is spotted with small bodies of Rosebud loam, and in places it has some of the characteristics of the Dawes loam and silt loam. The partly weathered Ogallala formation underlies the entire type at a depth of 4 to 6 feet, and in the more rolling areas it outcrops in places, giving rise to characteristic white spots on the hillsides.

The material has been derived by weathering from the calcareous sandstones of the Ogallala. The greater part of the type lies on almost level plains though in places the surface is gently undulating. The most rolling areas occur around the heads of streams. The flatter bodies occupy the greater part of the south divide and the large upland table-lands north and east of Chappell. In the zone between the loess deposits the type is almost entirely free from surface gravel, and the soil contains a large percentage of loessial silt, making it closely resemble the soils of loessial origin. The Rosebud silt loam also occupies many of the long slopes leading from the uplands to the valley bottoms.

The general direction of the drainage is southeast. Even in the nearly flat situations there is sufficient slope to afford an outlet for the surface water, and the porous subsoil and substratum insure ample underdrainage.

The Rosebud silt loam is one of the most important soils of the county, on account of its large extent and its natural crop adaptations. About 60 per cent of it is under cultivation and the rest is used for pasture and hay land.

Among the native grasses, buffalo grass is the dominant species. Grama grass, western wheat grass, wire grass, and a sedge (blackroot) are of secondary importance. Buffalo grass remains green

during July and August, but forms seed and ripens early in September. Grama grass and western wheat grass follow buffalo grass in growing period. Where the white subsoil is near the surface there is a thin growth of stipa during the early part of the season and a sparse growth of western wheat grass, which becomes more abundant as the depth of the surface soil increases. Where the land has been heavily grazed, a luxuriant growth of wire grass takes possession. Most of the weeds and wild flowers flourish in the early season, when the moisture is plentiful. This condition of native vegetation would suggest the advisability of growing early-maturing crops.

The most important cultivated crops are wheat, corn, and oats. Wheat occupies the largest acreage and is the chief cash crop. Both spring and winter varieties are grown, the latter being most popular. Turkey is the favorite variety, but the acreage of Kanred is increasing. Corn is grown as extensively as on any type in the county. Only the early-maturing strains are planted, chiefly dent varieties. Oats are grown to supply feed on the farms and ranches. The leading varieties are Swedish Select and Kherson. Alfalfa is gaining favor as a forage crop and has produced good results. It does well because the white material of the subsoil is high in lime, contains some very fine sand, and maintains a supply of moisture for the plant roots. Potatoes are produced for home consumption and for sale in the local markets.

A part of the type is included in stock farms and ranches, on which beef cattle, principally Hereford and Shorthorn are grazed. A few milk cows are kept on many farms, and some farmers have a surplus of dairy products for sale. A square mile supports 40 to 60 head of cattle the year around.

Wheat yields from 10 to 50 bushels per acre, depending upon the rainfall and farming methods practiced. It is believed by many farmers that high average yields are obtainable under good summer tillage methods. Corn yields 10 to 25 bushels of grain, and when cut for fodder from 1 to 3 tons per acre. In average years, oats yield 30 bushels and potatoes 100 bushels per acre. Alfalfa yields an average of 2 tons of hay in two cuttings.

No definite rotation is practiced as the necessity for special effort to maintain the productiveness of the soil has not been felt. Wheat frequently succeeds itself. On some farms alfalfa is rotated with corn and wheat. New land is generally broken to a depth of 3 or 4 inches, often by means of heavy moldboard plows drawn by tractors. Old land is generally plowed every second or third year. Small grains are usually sown with a drill on disked corn or stubble ground, though some winter wheat is seeded between the corn rows. Corn is generally listed as the moisture conditions are better than when planted in checkrows on a level surface. Some corn is planted on newly broken sod land. Plowing, disking, and seeding are often performed in one operation with the use of tractors.

The selling price of the Rosebud silt loam ranges from $60 to $90 an acre, depending upon improvements and location.

The Rosebud silt loam is naturally a fertile, strong soil and satisfactory yields are obtained where careful conservation of soil moisture is practiced. Frequent cultivation is necessary to keep the surface well mulched for corn and other intertilled crops, and a thorough preparation of the seed bed is advisable, even at the expense of acreage.

Rosebud silt loam, deep phase.—The deep phase of the Rosebud silt loam occurs on the flat table-lands in all parts of the county, but is most extensive in the wide basin between the loess ridges. In texture, structure, color, and drainage it is identical with the typical Rosebud silt loam, but it differs in the thickness of the upper subsoil. The loose, smooth, ashy-gray, floury silt of the lower subsoil is seldom encountered above 30 inches. The phase is preferred to the typical Rosebud silt loam on account of its flat topography, greater resistance to drought, and consequent larger crop yields. Its selling price ranges from $10 to $15 an acre higher than the typical soil.

KEITH SILT LOAM.

The surface soil of the Keith silt loam consists of a grayish-brown to dark grayish brown, friable, mellow silt loam, 10 to 12 inches deep. The subsoil is a brown to light-brown or grayish-brown, moderately compact, friable silt loam or in some places silty clay loam, which changes at 24 or 30 inches into a grayish-brown or pale yellowish gray silt or silt loam. The material of the lower subsoil is generally lighter in texture than the material above and continues below the 3-foot section, the substratum consisting of a light yellowish gray or buff-colored loess of great thickness. The material of the soil is specked with white particles of lime carbonate but shows no reaction to dilute hydrochloric acid; the lower subsoil is highly calcareous. The soil contains considerable organic matter.

The Keith silt loam is similar in origin to the Holdrege silt loam, which occurs farther east in the State, but differs from that soil in having a lighter colored surface soil and a subsoil of different structure. In the color of the surface soil and in its profile arrangement the Keith silt loam does not differ greatly from the Rosebud silt loam, but it has weathered from a different material.

As a whole, the Keith silt loam is remarkably uniform in texture and color over large areas, although on ridges and slopes the soil may be lighter in color than typical, and in small basinlike depressions it may be rather dark and much heavier than typical. Owing to its close association with the Colby silt loam, into which it grades, small bodies of the latter type are included.

The Keith silt loam occurs in small bodies on the high ridge of loess and in more extensive areas on the western margin of the high table-lands which extend eastward into Keith County. It occupies smooth ridges and hills and gentle slopes, and small pockets on the ridges. Drainage is adequate, except in the basin areas, where it is partly obstructed by lack of outlets. Much of the water gathers in the lower parts of these basins, and some escapes by downward percolation.

About 30 per cent of the type is under cultivation. It is a valuable agricultural type and could be more generally utilized for cropping. The native vegetation consists of buffalo grass, grama grass, western wheat grass, and the sedge, blackroot. Buffalo grass is the predominating grass. These grasses cover the ground with a thick mat and furnish excellent hay and pasturage, especially on areas where there is sufficient moisture present to keep the buffalo grass green. While the Keith silt loam is hardly more than half as productive as the principal upland soils of eastern Nebraska which receive

ample rainfall, its natural fertility is fully as great. During favorable seasons, when precipitation is adequate, crop yields are often more than doubled. The type was originally prairie, but there are a few planted woodlots of ash.

Winter wheat and corn are the principal crops, with barley, oats, and sorghum as minor crops. The soil is well adapted to general farming, but the small grains and forage crops do better on this type than corn. Winter wheat, the most profitable crop, yields 10 to 35 bushels per acre, depending on the season. Corn yields 10 to 25 bushels and occasionally more. Barley yields 10 to 35 bushels, oats 15 to 40 bushels, and sorghum 2 to 5 tons of forage per acre. Potatoes are grown for home use and do well in favorable years.

Beef and dairy cattle and hogs are raised in conjunction with grain farming. Hog raising, however, has declined somewhat on account of low market prices. Dairy cattle are kept mainly to supply home needs.

Wheat is drilled either in stubble ground or old corn land. Land for corn is disked and the seed listed. Both crops frequently succeed themselves. Farm tractors are being introduced and much of the heavy farm work is done with motor power. Sod land is broken with tractors to a depth of 3 or 4 inches. Owing to its smooth topography and friable silty character, this soil is easily handled under a wide range of moisture conditions. Where the land is disked before listing corn, it withstands drought well. Little barnyard manure is used and the cultural methods are practically the same as on the other heavy upland types.

Land of this type is valued at $75 to $100 an acre, depending upon the improvements.

The Keith silt loam is among the best soils of the county. It contains sufficient organic matter and fine material to prevent excessive drifting. If it is cultivated when rather wet, it may clod to some extent, but the clods readily break down under proper cultural methods. It will give good yields for a long time, but provision should be made to maintain productiveness. Although there is no immediate need for organic matter, the content should be kept up by applying barnyard manure. The moisture supply should be conserved by tillage after each soaking rain.

COLBY SILT LOAM

The surface soil of the Colby silt loam is brown to light grayish brown, calcareous silt loam, 10 to 12 inches deep. The upper subsoil is of similar or slightly lighter color, though identical in texture and structure. It has the characteristic smooth, floury feel of the loess material from which it is derived and grades with depth into the very light colored, unweathered parent loess.

There are a few variations from the typical. On the smoother and less eroded areas the surface layer extends to a greater depth, and in places where erosion has been more active it is shallower and the white material of the subsoil lies closer to the surface.

The Colby silt loam occurs in the northeastern part of the county on a long ridge varying from 1 mile to 1½ miles in width, and in the northeastern corner it occupies the western margin of a body of loess

continuing into Keith County on the east. It also fringes the small canyons draining this latter deposit.

The topography in general is gently sloping to undulating; along the drainage ways it is rolling. The drainage is thorough, because of the open soil structure and the sloping topography. The subsoil retains moisture remarkably well, and consequently the yields during seasons of low precipitation are higher than those obtained on the heavier Keith silt loam.

Part of this type is used for cultivated crops, but the larger part is in hay and pasture land. Grama grass and buffalo grass predominate among the native grasses and cover the surface of the ground with a thick mat. There are scattered areas of big bluestem and wire grass. Along the drainage ways, where erosion has been severe and has produced the catstep formations typical of the loess deposit, patches of bunch grass occur, while western wheat grass flourishes in the moister areas and where the type approaches the Keith silt loam. From 6 to 8 acres of this land are considered sufficient to support one horse or steer, where supplemented with feed during the winter months.

Wheat and corn are the principal crops, with sorghum next in importance. Not more than 25 per cent of the type is under cultivation, however. Over a series of years, under dry-farming methods, wheat averages 10 to 12 bushels per acre, though much higher yields are obtained in favorable years. Corn ranks close to wheat in acreage, and yields from 12 to 15 bushels per acre on an average. The range in increased yields brought about by favorable rainfall is equally as great as in the case of wheat. Sorghum produces from 1 to 3 tons of forage per acre. Oats and barley are crops of minor importance.

Owing to its friable silty character, the soil is very easily worked, can be handled under a wide range of moisture conditions, and retains moisture well. Where the field is disked before listing for corn it withstands drought well. Occasionally it is plowed, but this practice invites drifting when the soil is thoroughly broken. No commercial fertilizer is used, but manure is applied by the more progressive farmers.

The Colby silt loam sells for $60 to $90 an acre, depending upon improvements and topography. The badly eroded areas have a much lower value, and are always sold in conjunction with areas of more tillable farm land.

The organic content of this soil is naturally low, and its porous nature permits the leaching of plant food. The soil has a tendency to wash. Cultural methods designed to remedy these features should be adopted. Overgrazing in the pastures should be avoided.

DAWES SILT LOAM.

The characteristic feature of the Dawes silt loam is the compact upper subsoil layer. The surface soil has an average depth of 10 to 12 inches and is a grayish-brown to very dark grayish brown friable silt loam, with a relatively high content of organic matter. In places there are small quantities of rounded quartz and feldspathic pebbles strewn over the surface. The upper subsoil, to an average depth of 20 to 24 inches, is a dark-brown or grayish-brown to dark-gray silt loam or silty clay loam, which is compact in place but easily crumbled between the fingers. The lower subsoil is a light-gray to almost

white, highly calcareous, loose, floury silt to silty clay. The upper subsoil varies in thickness. In places it extends to 30 inches and in others the layer is very thin, but it has an average thickness of about 12 inches. Locally the lower layer approaches a silty, very fine sandy loam and contains some fine gravel.

The Dawes silt loam is uniform over large areas. Although the thickness of the heavy layer may vary within short distances, the average depth to the white calcareous material is much greater than in the Rosebud types. In the deeper depressions the soil and upper subsoil are darker colored, and the latter is tougher and more compact, in contrast to its typically friable and moderately compact structure.

The Dawes silt loam occurs in areas of varying size through the upland plains of the county. A typical area lies 3 miles east of Chappell. The largest areas lie about 3 miles north of Bellevue School and southeast of Froid School, along the western front of the loess ridge. Other typical areas are mapped on the south divide.

The Dawes silt loam occupies flat to gently undulating positions where drainage ways are in their initial stage of development. The nearly level surface favors the retention of moisture, giving the soil a slight advantage over the Rosebud types. The smooth surface is also favorable for extensive farming and the use of motor machinery.

The Dawes silt loam is mainly residual in origin, being derived by weathering from the white, calcareous, silty, and fine sandy materials of the Ogallala formation. The surface has been slightly modified by wind action and the addition of wash from higher lying areas.

The type is well adapted to agriculture under the prevailing climatic conditions. A large part of it is under cultivation, and about 30 per cent is in pasture land.

The native grasses include luxuriant growths of buffalo grass, grama, and western wheat grass. The livestock industry consists of the raising of beef cattle, which are generally sold as stockers and feeders. Many farmers have a few milk cows for home use and sell the surplus dairy products. A few hogs are raised on many farms. From 7 to 10 acres per steer are required for pasture.

Wheat and corn are the principal crops. Fair yields of wheat are obtained in seasons of normal rainfall, winter wheat yielding 10 to 30 bushels per acre and spring wheat somewhat less. Under summer tillage methods from 20 to 50 bushels per acre are obtained, the average being about 25 or 30 bushels. Corn yields range from 10 to 25 bushels and occasionally more, with an average of about 15 bushels. The dent varieties are preferred. The crop is attacked by cutworms and smut, and, owing to the short growing season, is often soft and immature. Barley produces 15 to 40 bushels per acre, and millet yields 1 to 2 tons of hay, or 20 to 35 bushels of seed. Oats do well but are somestimes injured by warm winds at critical periods. Sorghums and Sudan grass are good forage crops and yield from 3 to 4 tons per acre on an average. Potatoes thrive in this soil, but are grown mainly for home use. Alfalfa is grown locally with apparent success. It yields about 2 tons per acre from 2 cuttings. Occasionally the crop affords 3 cuttings and a larger total yield. The soil, having a high lime content, should be well adapted to alfalfa. Moisture supply is the controlling factor in the production of this crop.

No definite rotation is practiced, as the yields have not as yet declined through continuous cropping. New land is broken to a depth of 3 or 4 inches, a tractor and heavy plows commonly being used. Old land is generally plowed every two or three years. Small grains are usually drilled in corn or stubble ground, though some winter wheat is seeded between the corn rows. Corn is usually listed, as moisture conditions discourage surface planting. Some corn is planted on newly broken sod land. Plowing, disking, and seeding are often done in one operation, with the use of a tractor. Occasionally barnyard manure is applied with beneficial effects.

The sale value of land of this type ranges from $65 to $125 an acre, depending upon local conditions. Some farms are held for higher prices because of improvements and good location with respect to markets.

This type is naturally very retentive of moisture, and consequently good yields are obtained, except in the driest years. Frequent cultivation is desirable to maintain a loose surface mulch and prevent the evaporation of moisture. Some farmers cultivate during periods of long drought, as well as immediately after rains. Alfalfa should be a profitable crop.

SCOTT SILTY CLAY.

The surface soil of the Scott silty clay consists of 10 to 12 inches of dark-brown to dark-gray compact silty clay. The subsoil is a gray, tough silty clay which becomes lighter in color below 24 to 30 inches. Both surface soil and subsoil are sticky and plastic when wet and hard and brittle when dry. In places the subsoil shows no appreciable change in color or texture to a depth of 3 feet or more. The entire section is so compact as to be almost impervious.

The Scott silty clay is fairly uniform in texture, particularly in the large areas. The smaller areas, especially in the loess region, have a silty clay loam surface soil, and near areas of sandy soils there may be sandy material on the surface.

The type occurs in sinklike depressions widely distributed over the uplands. The areas range from less than an acre to 60 acres or more, and many are too small to be shown on the map. One of the largest lies about 2 miles southeast of Froid School. Another is a mile southwest of Mount Pleasant School. The soil consists of sediments carried by sheet water from the surrounding higher lying areas into shallow depressions, locally called "buffalo wallows." As these have no outlet, precipitation escapes only by evaporation or downward percolation. After heavy rains water stands on the surface for a few days to a week or two.

On account of its poor drainage, the type is used mainly for pasture and hay land. Occasionally it is broken in conjunction with neighboring soils and used for corn and wheat, but the crops either "drown out" or "dry out," depending on the season. The native vegetation consists of large quantities of carex, some gum weed, smartweed, and in wet places meadow marigold. The growth of grama grass and buffalo grass is sparse; some western wheat grass is cut for hay. Owing to the more favorable moisture conditions the vegetation is more luxuriant than on other upland types. The soil is always sold in connection with adjoining types.

The type could be cropped if adequate drainage were provided, but as a rule this is not done. Special treatment is required to produce a good tilth, as the material is too compact in its natural state. On the whole, this does not pay.

The following table gives the results of mechanical analyses of samples of the soil, upper subsoil, and lower subsoil of the Scott silty clay:

Mechanical analyses of Scott silty clay.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
373223	Soil, 0 to 12 inches	0.4	0.8	0.7	4.6	14.4	40.8	38.2
373224	Upper subsoil, 12 to 30 inches	.2	.7	.5	4.2	16.2	37.9	40.3
373225	Lower subsoil, 30 to 36 inches	.0	.2	.4	5.4	24.6	40.2	29.0

CANYON GRAVELLY SANDY LOAM.

The Canyon gravelly sandy loam to a depth of 6 to 12 inches is a grayish-brown sandy loam containing a relatively high proportion of angular limestone pebbles and fine gravel which impart to the soil a loose porous structure. This is underlain by lighter colored sandy and silty material which grades rapidly into the bedrock of the Ogallala formation. The sand content varies from fine to coarse.

The type includes areas of stony loam too small to show separately. In these areas the surface soil is lighter in color, the stone content is greater, and the slopes are steeper than on the typical soil. Rock outcrops are common, and the land has a lower value than the gravelly sandy loam.

The Canyon gravelly sandy loam is confined to the slopes of Lodgepole Creek Valley and the crest of the divide southeast of Chappell between Lodgepole Creek and the South Platte River. The topography is rolling to hilly, and where the bedrock is exposed in bluffs it is steep. The stony loam occupies the rougher areas while the gravelly sandy loam occurs where the surface is smoother and less eroded. A common feature of the rough land is the hard, nearly white, calcareous conglomerate of the Ogallala formation which in places caps the hills and ridges.

The soil is droughty and unsuited to agriculture. The type supports a fair growth of grama, buffalo, and wire grasses and affords some grazing. From 12 to 20 acres are required per head of livestock.

The soil is usually sold in connection with adjoining soils of higher agricultural or grazing value. From $10 to $12 an acre is the average price.

CANYON SILT LOAM.

The surface soil of the typical Canyon silt loam is a brown to grayish-brown friable silt loam, 8 to 10 inches deep. The subsoil is calcareous and gradually becomes lighter in color with depth until the bedrock is encountered. The soil profile is similar to that of the Rosebud, but the white layer is absent, as sufficient time has not elapsed for its formation. Areas of loam too small to map have been included with this type.

As mapped in Deuel County, the type includes a distinct variation. This consists of a shallow brown surface soil, which passes into a white, floury, calcareous subsoil, the result of an accumulation of lime, underlain at shallow depths by the parent rock. It is technically a shallow phase of the Rosebud silt loam, but owing to the intermingling of this soil and the typical Canyon silt loam, it is deemed impracticable to separate them. Both owe their origin to rapid erosion by which the surface soil has been removed almost as fast as weathering has broken down the parent rock. Bedrock is everywhere near the surface and in many places it is exposed, giving a white-spotted appearance to the hills.

The type occurs in scattered areas in the upland, but most commonly in irregular areas about the heads of drainage ways where erosion is more rapid. The type occupies winding ridges, isolated knobs, and low mounds in the more level parts of the county; the topography is rolling to hilly, and drainage is generally excessive.

Owing to its shallow depth, porous structure of the bedrock, and the unfavorable topography, the soil is droughty and unsuited for agriculture. It is used chiefly for pasture and supports a fair growth of nutritious grasses, including grama grass, buffalo grass, and the sedge, blackroot. From 10 to 15 acres are required to support one cow or steer. The type is usually sold in conjunction with neighboring areas of better soils, which influence its selling value somewhat.

On account of its topography and exposure to erosion, the pasture land should be guarded against overgrazing and entire destruction of the grass covering.

VALENTINE LOAMY FINE SAND.

The Valentine loamy fine sand consists of 10 to 15 inches of brown to grayish-brown, loose, friable loamy fine sand. The depth and color vary with the topographic position. In the basin areas, where accumulation of organic matter is favored, the soil is deeper, darker, and more coherent. The subsoil is a loose, incoherent, brown to light yellowish brown fine sand or sand which grades downward into coarse gray sand. Both soil and subsoil are low in organic matter and deficient in lime.

The Valentine loamy fine sand occurs in several areas in the lower part of Lodgepole Creek Valley and in the upland to the east. The surface is gently undulating and broken by small ridges and knolls. Surface drainage is not established. The rainfall sinks into the porous sand and is carried away through underground channels.

The soil when broken drifts badly, and for this reason nearly all of the type is used as pasture and hay land. Small fields are cropped to corn and potatoes, but the soil does not retain as much moisture as the fine sandy loam, owing to its open structure. The native vegetation consists of bunch grass, stipa, grama grass, sand grass, and scattered clumps of sagebrush. When cut for hay it produces from one-fourth to three-fourths ton per acre, depending on the rainfall. The type will pasture from 30 to 40 head of cattle per section. The price of this land varies from $10 to $15 an acre.

Parts of the Valentine loamy fine sand can be cultivated to crops under careful management. It is used successfully for corn and potatoes in other western counties of the State. The broken surface, however, should be kept as rough as possible to prevent drifting, and the content of organic matter should be increased by the application of barnyard manure, straw, or other coarse materials.

Several areas of loamy sand have been included with this type on account of their small size. They occur in four localities in the lower Lodgepole Creek Valley and the adjacent upland. The soil is slightly coarser in texture than the typical Valentine loamy fine sand, and the subsoil is looser and more porous, resembling that of Dunesand. Drifting is more prevalent than on the typical loamy fine sand, and the topography is more choppy and dunelike. In agricultural value the loamy sand lies between the Dunesand and the loamy fine sand.

VALENTINE FINE SANDY LOAM.

The surface soil of the Valentine fine sandy loam consists of a brown to dark grayish brown fine sandy loam, fairly rich in organic matter. It contains a relatively high percentage of very fine sand and sufficient clay and silt to prevent excessive wind erosion. At a depth of 15 to 18 inches the color becomes somewhat lighter and the soil slightly sticky. This condition is maintained throughout the section, except that the lower part becomes lighter in color. The type differs from the Rosebud fine sandy loam chiefly in the less calcareous nature of its subsoil.

The type is fairly uniform over its entire area. Locally the dark color extends throughout the section, especially in the lower positions where the topography is nearly flat.

The type occurs mainly in the valleys and basinlike depressions of the lower Lodgepole Creek Valley and the adjacent land to the east, where it is associated with Dunesand. Much of the material has been derived through wind deposition of sandy and other fine materials from the bed of Lodgepole Creek. A large isolated body mapped along the eastern edge of the southern part of the loess ridge consists of a series of low ridges and hills, and the lower subsoil in places is light gray or yellowish gray. This body is probably derived from the stratum of sand underlying the loess.

The drainage is good but not excessive. The topography is exceedingly favorable for the accumulation and retention of moisture, and practically all the rainfall is immediately absorbed, very little running off. The position of the type is more favorable to the accumulation of organic matter than that of the sandier types of the series.

The type is not important agriculturally because of the danger of drifting when improperly handled, and very little of it is under cultivation. Most of it is included in farms on which cattle raising is an important industry. The native vegetation consists of grama grass, buffalo grass, needle grass, and scattered clumps of bunch grass.

The principal crops are corn, wheat, rye, and sorghum. Corn is fairly profitable, though yields vary from year to year, ranging from 15 to 30 bushels or more according to the season. Wheat produces 10 to 20 bushels, occasionally more, and rye 12 to 20 bushels per acre. Sorghum ordinarily yields from 1 to 2 tons of forage per acre. Po-

tatoes do well but are grown mainly for home use. Wheat and rye are sown between corn rows. Although the type is less subject to drifting than the sandier members of the series, caution should be exercised and the crop should be cultivated only enough to kill the weeds and maintain a surface mulch. The land is valued at $15 to $30 an acre, depending on improvements and the proportion of sandier types included.

CHEYENNE GRAVELLY SANDY LOAM.

The Cheyenne gravelly sandy loam consists of 15 to 18 inches of brown to grayish-brown gravelly sandy loam, underlain by a grayish-brown calcareous gravelly sandy loam containing large quantities of coarse sand and gravel. At 30 to 36 inches a coarser substratum is encountered which extends beyond the soil section and is slightly calcareous.

In many of the smaller draws the surface soil consists simply of loose, porous masses of unconsolidated grayish gravel and various grades of sand. In places there is practically no difference in soil and subsoil throughout the section. Fragments of lime-cemented sandstone make the soil and subsoil more or less calcareous.

The type occurs as narrow strips of alluvial wash in the beds of the larger intermittent streams, and on the high and low terraces along Lodgepole Creek and South Platte River and some of their large tributaries. The bodies vary in width from several rods to over three-fourths mile, the larger areas occurring along the larger streams. The material is derived from the Ogallala formation, but has been subjected to little weathering. Torrential rains have carried these coarse materials down and deposited them in the valleys. Owing to the exceedingly open structure of the soil and subsoil, drainage is in most places excessive and the soil is very droughty.

Where the surface soil is loose and friable the land hardly produces enough grass for pasturing. The vegetation includes a sparse growth of sand reed grass, thin patches of buffalo grass, and a little ragweed. The better areas, where the gravel beds lie deeper, support some western wheat grass, wire grass, and sage (*Artemisia frigides*).

Under irrigation or good dry-farming methods some crops can be successfully grown on this type where it is not too droughty. Among these are wheat, corn, potatoes, garden truck, and alfalfa. Corn and wheat do fairly well in good years. The soil is well adapted to potatoes and garden vegetables. Alfalfa occupies a few patches, but the acreage is not likely to increase because of the droughty nature of the soil.

Land of this type sells for $10 to $30 an acre, depending on location, improvements, and utilization.

The following table shows the results of mechanical analyses of samples of the soil, subsoil, and substratum of the Cheyenne gravelly sandy loam:

Mechanical analyses of Cheyenne gravelly sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
373203	Soil, 0 to 18 inches	5.8	20.0	13.0	23.0	22.1	10.0	6.2
373204	Subsoil, 18 to 36 inches.	18.9	20.6	6.0	20.5	20.2	8.0	5.9
373205	Substratum, below 36 inches	17.6	29.7	10.8	16.9	14.8	6.0	4.2

CHEYENNE FINE SANDY LOAM.

The Cheyenne fine sandy loam has a brown or grayish-brown, loose, friable fine sandy loam surface soil 12 to 15 inches deep. The subsoil is a loose, incoherent mixture of fine sand and gravel, gray to light grayish brown in color. Some bodies have a high silt content. The sand and gravel are chiefly quartz and pinkish feldspathic fragments. Both soil and subsoil are calcareous in places owing to the presence of numerous fragments of lime-cemented sandstone. Below depths of 30 inches the substratum is composed largely of coarse sand and gravel. In a few areas the surface soil is coarser and in reality constitutes a sandy loam, but these areas are small and are included with the type.

The Cheyenne fine sandy loam occurs as narrow bodies on high terraces of South Platte River, on the bench lands of some of the dry drainage ways, on a few of the colluvial slopes of Lodgepole Creek and as strips on some of the first bottoms of draws, chiefly Walrath Draw. It is frequently associated with small bodies of Cheyenne loam and gravelly sandy loam. It has been derived from the same materials as the other Cheyenne soils and represents a gradation between the gravelly sandy loam and the loam.

Drainage is everywhere adequate and in many places, owing to the porous nature of the soil and subsoil, excessive. The surface is almost flat and slopes gently down the valley and toward the stream channel.

The type is of minor agricultural importance. It is droughty under anything except the best dry-farming conditions or irrigation. It is used in part for grazing and the production of wild hay and in part for crop production. The native grasses include wire grass, buffalo grass, grama grass, and a very thin growth of western wheat grass. Beef cattle, principally Hereford and Shorthorn grades, are grazed on the uncultivated areas.

Wheat, corn, and potatoes are grown to a small extent. Where enough moisture is available good yields are obtained, as the soil is reasonably fertile. The same varieties of crops are grown and about the same cultural methods followed as on the heavier terrace soils, but the yields are small owing to the droughty nature of the soil. The degree of success depends largely on the depth to the gravel layer and the amount of water available. The type has a selling value of $25 to $35 an acre, based on location, improvements, and crop adaptation.

In cropping this soil care must be taken to prevent drifting. Special methods of tillage should be adopted, such as drilling the wheat among the corn rows, and running the rows east and west, i. e., at right angles to the prevailing direction of strong winds. The productiveness of the type could be increased by the application of barnyard manure and other organic matter; a practice that also would aid in checking drifting.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of Cheyenne fine sandy loam:

Mechanical analyses of Cheyenne fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
373226	Soil, 0 to 15 inches.....	2.1	5.0	3.7	41.2	27.7	14.2	6.0
373227	Subsoil, 15 to 36 inches..	7.0	14.8	8.2	24.3	26.7	12.4	6.4

CHEYENNE LOAM.

The surface soil of the Cheyenne loam consists of 12 to 15 inches of brown to grayish-brown loam, which is usually rather fine in texture, in places approaching a silt loam, but generally has a friable, mellow structure. The subsoil is a grayish-brown friable loam, which may continue throughout the 3-foot section or may grade above 36 inches into a porous layer of unconsolidated sand and gravel, brown to light brown in color. This coarse layer has a larger proportion of finer materials than the porous layer underlying the lighter members of the Cheyenne series. Both soil and subsoil contain fragments of water-worn gravel and are slightly calcareous.

This type has a relatively small total area. It occupies high and low terraces of Lodgepole Creek and South Platte River and borders some of their tributaries. Several areas lie south of Chappell. Another lies in the valley of the South Platte River, about 1 mile from the point where the river enters the county.

The topography is flat or slopes gently toward the main axis of the stream. Owing to its porous structure, the type is adequately to excessively drained, depending on the nearness of the gravel layer to the surface.

About 30 per cent of the type is under cultivation, and the remainder is used for pasture and hay land. The soil supports western wheat grass, and sparse growths of wire, buffalo, and grama grasses. One section of land will support 40 to 50 head of cattle.

Wheat, corn, and alfalfa are the principal crops. Wheat is the cash crop, while corn and alfalfa are mostly fed to stock. Yields are lower than on the other heavy terrace soils, owing to the porous nature of the subsoil, but under irrigation these crops do well. This soil is friable and easy to handle, and more of it could be used profitably if irrigation facilities could be extended. The cultural methods are identical with those on other terrace soils. Barnyard manure is applied occasionally.

Dry-farmed land of this type sells at $20 to $30 an acre, depending upon the location and improvements.

TRIPP VERY FINE SANDY LOAM.

The surface soil of the Tripp very fine sandy loam is a brown to grayish-brown, moderately calcareous very fine sandy loam, 10 to 12 inches deep, which is slightly compact in places, but for the most part is loose and friable. The subsoil consists of a slightly lighter colored, loamy or silty very fine sand, which grades rapidly into an almost white, loose, floury, very calcareous silt similar to the subsoil of the Rosebud fine sandy loam. This has a smooth feel and in many places a yellowish color.

There is considerable variation over the type. Where the soil is poorly drained the surface soil is lighter in color, being either light gray or light brown. On old terraces, on the other hand, brown and darker colors prevail and the materials are slightly sticky. In places the subsoil contains thin layers of finer and coarser materials. In other places there is no distinct zonation in soil and subsoil and little change in the 3-foot section, probably because the material is of rather recent deposition and has not leached sufficiently to produce

the gray subsoil characteristic of the series. Two small areas of fine sandy loam in the valley of the South Platte River have been included with this type.

The Tripp very fine sandy loam occurs in irregular-shaped areas in Lodgepole Creek and South Platte River Valleys, the most uniform areas being in Lodgepole Creek Valley. It occupies low and high terraces of comparatively recent deposition, which have been modified by colluvial wash from the adjacent uplands and by the addition of some wind-blown silt and fine sand.

The surface is almost flat, sloping very gently toward the main streams, but drainage is fairly good, as the porous nature of the soil and subsoil usually permits the escape of surplus water.

Most of the type is in cultivation and part is under irrigation. The rest is used as pasture and hay land. The native vegetation consists of western wheat grass, Indian grass, and sand reed grass. Russian thistle is a common weed. Sweet clover thrives along the roadsides, where drainage is poor, indicating a favorable adaptation of this soil to legumes. On the margin of areas adjacent to areas of the Laurel soils, encroachments of salt grass are not uncommon.

The type is well adapted to all the common crops, including sugar beets, potatoes, corn, wheat, oats, alfalfa, and vegetables. Corn yields from 15 to 35 bushels, wheat 10 to 30 bushels, and oats 20 to 50 bushels per acre. Alfalfa produces 2 or 3 cuttings, depending on the season and the irrigation facilities. Potatoes and garden vegetables are grown for home use.

The land is prepared in the spring as soon as the frost is out of the ground. Old fields are plowed every third or fourth year. Corn or wheat stubble is generally prepared for small grain by double disking. No definite crop rotation is practiced.

The land sells for $50 to $75 an acre, depending upon the location, topographic position, improvements, and the possibility of developing irrigation.

This soil is very productive, easily handled, and very retentive of moisture. Owing to the coherency of the materials, the danger of wind erosion under careful management is slight. Occasional applications of barnyard manure will increase the organic content and help still further to stabilize the soil. The type is well adapted to irrigation because of its excellent internal drainage.

TRIPP SILT LOAM.

The surface soil of the Tripp silt loam is a brown to grayish-brown, fairly heavy, but friable silt loam 10 to 12 inches deep, the color depending upon the organic matter present. The soil is usually fine and has little sand of any grade. It is usually underlain by a layer of 3 to 6 inches of slightly heavier silt loam which is moderately calcareous, but in some areas this layer is absent. Below this the subsoil consists of the gray to yellowish-gray, highly calcareous silt loam characteristic of the series, which ordinarily continues throughout the 3-foot section, but in many places passes into a silty very fine sandy loam at a depth of about 40 inches.

The type is moderately extensive. It occurs principally on the high and low terraces along Lodgepole Creek and South Platte River and some of their large tributaries. One of the larger and most typ-

ical areas lies about a mile south of Pleasant Hill School in the South Platte Valley. Another very large area is mapped just east of Walrath Draw and north of the Lincoln Highway. The soil consists of reworked sediments washed down from the uplands and from the more elevated regions to the west. The surface is level to gently undulating. The surface drainage is generally good and the internal drainage is adequate.

Nearly 75 per cent of the type is under cultivation and it is quite important agriculturally in the county. The balance is used as pasture and hay land. The natural vegetation includes buffalo grass, western wheat grass, big bluestem, and some Indian grass; it does not include the sand reed grass of the Tripp very fine sandy loam. Salt grass has encroached upon the more poorly drained areas, and Psoralea flourishes in the pastures. Sweet clover thrives along the roadside. Seepage waters from the irrigation ditches encourage dense growths of giant ragweed, sunflower, and pigweed.

Corn, alfalfa, and sugar beets are the important crops. Sugar beets constitute the cash crop and the most important crop on irrigated land, and yield from 10 to 21 tons per acre. Corn does well when irrigated, yielding from 20 to 50 bushels per acre, and occasionally more. Alfalfa gives a total of 3 or 4 tons from 3 cuttings. The minor crops include oats, barley, potatoes, and garden vegetables. On the unirrigated land native grasses yield from one-fourth to 1 ton of hay per acre, depending on the season; or they will support from 30 to 40 head of cattle per square mile the year around. Most of the corn is fed on the farms where produced. The ears are generally snapped and stored for winter feed; sometimes the corn is cut for fodder.

The soil is handled in much the same manner as the heavy upland types. Sugar beets require intensive cultivation and much hard labor. The topography favors the accumulation and retention of moisture. No definite rotation is practiced, as the soil shows no signs of decreasing productiveness. Barnyard manure is applied occasionally.

The land sells at prices ranging from $35 to $250 an acre, depending largely upon the possibility of irrigation, the improvements, and the location with respect to transportation.

Owing to the high productiveness of the soil under favorable moisture conditions or under irrigation, it should prove profitable to use more of it for corn and alfalfa rather than for pasture. At present there is no injurious accumulation of alkali in the soil, but care should be exercised to prevent salts from concentrating near the surface.

BRIDGEPORT FINE SANDY LOAM.

The Bridgeport fine sandy loam consists of a brown, loose, friable fine sandy loam, with practically no change in color or texture throughout the 3-foot section. In places the surface layer is darker than the rest of the soil owing to a higher content of organic matter. The surface soil is slightly calcareous and the subsoil has a moderate lime content but lacks the characteristic white layer of the Tripp fine sandy loam. Small areas of sandy loam and very fine sandy loam have been included with this type.

The soil occurs in scattered areas on the slopes and terraces of Lodgepole Creek, South Platte River, and minor tributaries. Its

surface is slightly rolling to gently undulating, and drainage is adequate owing to the open porous structure of soil and subsoil.

The Bridgeport fine sandy loam is of little agricultural importance. A small part is under cultivation; the rest is used as pasture and hay land. The native vegetation consists of stipa, sand reed grass, redfieldia, and some big bluestem grass. From one-fourth to one-half ton of hay per acre is obtained. From 15 to 20 acres are required to pasture one cow or steer the year around. The type is inferior to Dunesand for grazing. Corn, which is practically the only cultivated crop, yields fair returns. Rye, sorghum, and potatoes do well.

The soil has a tendency to drift, and care must be exercised, after the removal of the native sod, to maintain as rough a surface as possible. This land, without irrigation facilities, sells for $10 to $15 an acre.

Most of the Bridgeport fine sandy loam is adapted to irrigation, as the porous soil would afford excellent drainage and tend to prevent the accumulation of alkali.

BRIDGEPORT LOAM.

The surface soil of the Bridgeport loam is a brown to grayish-brown friable loam, 12 to 15 inches deep, usually containing a relatively large proportion of very fine sand. The immediate surface layer is rich in organic matter and has a darker color than the lower part of the surface soil. There is little difference in texture or structure between soil and subsoil. Locally the color is the same also, but more commonly the subsoil is somewhat lighter. The soil shows no reaction with hydrochloric acid but the subsoil has a low lime content in places. The surface is frequently strewn with quartzitic and feldspathic gravel, and in a few places gravel is found in the upper subsoil.

The Bridgeport loam is not extensive in Deuel County. It occurs principally on the high terraces along Lodgepole Creek and South Platte River, where it is associated with soils of the Cheyenne series; it also borders the upper channels of major tributaries such as Walrath Draw. A large and typical area lies just west of Perdu School. The largest area is about 3 miles east of Bellevue School. The type consists of sediments washed down from the uplands and deposited over the valley slopes. Its surface is nearly flat, sloping gently down the valley and toward the stream channel. The slight slope and the porous nature of the soil and subsoil afford ample drainage.

Owing to its favorable topography and its productiveness the soil is rather important. Approximately one-half of it is under cultivation. The uncultivated land is used for pasture and for hay production. The sod includes bluestem grass and thin growths of buffalo and grama grasses. Wire grass is conspicuous in areas heavily pastured and these plots are also subject to invasion by sagebrush.

Wheat, corn, and oats are the principal crops. Wheat is the cash crop and yields from 10 to 30 bushels per acre, depending on the season. Corn gives from 10 to 25 bushels, and oats 20 to 45 bushels per acre. The soil is handled in the same manner as the other heavy bench-land types. No definite rotation is practiced. Barnyard manure is occasionally applied. This type of soil sells at $40 to $75 an acre.

The following table shows the results of mechanical analyses of samples of the soil and subsoil of the Bridgeport loam:

Mechanical analyses of Bridgeport loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
373236	Soil, 0 to 15 inches.....	1.5	9.4	6.2	17.4	31.0	27.4	7.1
373237	Subsoil, 15 to 36 inches.	2.2	7.0	4.3	16.6	34.9	25.6	9.3

BRIDGEPORT SILT LOAM.

The Bridgeport silt loam to an average depth of 10 or 12 inches is a grayish-brown friable silt loam. The surface layer in places is darker in color, as the soil is rich in organic matter. There is little change in texture throughout the soil section, but the color becomes lighter with depth. Below 30 inches the material is slightly calcareous, and while it has the appearance of being slightly compact it crumbles easily into a loose, friable silt loam. Owing to the finer texture and high content of organic matter, the soil is not as subject to wind erosion as the lighter members of the series. It retains moisture and is an excellent soil for dry farming as well as irrigation.

This is an extensive alluvial type. It occurs in areas of varying size on the high and low benches of Lodgepole Creek and South Platte River and their larger tributaries, bordering the channels in places along the upper course. A typical area lies about 1 mile west of Chappell; another large body is 1 mile south of Barton. The soil consists of colluvial and alluvial material washed down from the adjoining uplands and carried in by the main stream from the higher lying regions to the west. By far the greater part of the type occupies a smooth, undulating slope, and even the more nearly level bodies slope gently in the direction of stream flow. The relief is generally sufficient to carry off the surplus water, and the porous subsoil affords ample underground drainage.

The Bridgeport silt loam is important agriculturally. About one-third of it is under cultivation, and the rest is used as pasture for beef cattle and horses and for hay production. The native grasses consist of grama, buffalo, and western wheat grasses. They yield from one-fourth to one-half ton of hay per acre, depending on the season. The cattle grazed are mainly Hereford and Shorthorn grades. From 7 to 10 acres of pasture are required for each animal.

In the dry-farmed areas corn yields 10 to 25 bushels of grain per acre or 2 to 3 tons of forage when cut for fodder. Wheat yields 10 to 30 bushels and oats 15 to 40 bushels per acre. Alfalfa yields from 2 to 3 tons of hay per season.

The selling price of this land ranges from $40 to $75 an acre, depending upon improvements, distance from markets, and irrigation possibilities.

The Bridgeport silt loam is naturally productive and under irrigation yields as well as other bench-land types. Much of the land used for hay and pasture, as well as cropped land, is well suited to irrigation.

Bridgeport silt loam, basin phase.—The surface soil of the Bridgeport silt loam, basin phase, is a brown to grayish-brown mellow silt loam 12 to 15 inches deep. The subsoil is generally of similar or slightly heavier texture; in places there is no change in color or texture throughout the 3-foot soil section. It is not unusual, however, to encounter the white or yellowish-white calcareous subsoil characteristic of the Rosebud series just below the 3-foot depth. The soil is not calcareous, but the subsoil shows a very slight reaction with dilute hydrochloric acid.

The phase occurs in irregular-shaped areas of various sizes, scattered over the entire upland of the county, except in the loess region. The topography is flat. The soil occupies depressions and is surrounded by upland types. One large area lies about 3 miles northeast of Big Spring on the county line, and another a mile east of Bellevue School.

Owing to the porous and friable nature of soil and subsoil, the phase is adequately drained. The soil has been derived from wash of the higher lying surrounding soils carried by sheet water into the depressions.

Although the phase is of small extent, it is one of the most important soils in the county. It is productive, retentive of moisture, and well adapted to farming in a region of light rainfall. About one-half of it is under cultivation, the remainder being used for pasture and for hay production. It supports a dense growth of buffalo and grama grasses and some blackroot (a sedge) and western wheat grass. From 5 to 7 acres are required for pasturing one cow or horse. Shorthorn and Hereford are the favorite breeds of beef cattle; the herds are composed mainly of grades. They are sold principally as stockers and feeders.

All the grains common to the region can be successfully grown. Wheat is the principal cash crop. Both spring and winter wheat are grown, but the latter occupies the greater acreage. Turkey and Kanred are the principal varieties. Corn does well, the dent varieties being the favorite. Oats are grown chiefly for feed. Wheat yields 10 to 25 bushels per acre under ordinary dry-farming conditions; corn averages about 20 bushels per acre but the yield varies widely with the rainfall; and oats yield about 30 bushels.

Owing to the friable nature of the soil, no greater care is required in cultivation than is necessary on the other important upland soils. No definite crop rotation is followed and no fertilizers are used, as the land is comparatively new and there is no danger of immediate loss of productiveness.

Land of Bridgeport silt loam, basin phase, sells for $50 to $85 an acre, the price varying with the improvements and location.

YALE SILT LOAM.

The Yale silt loam consists of a brown to grayish-brown friable silt loam, which passes abruptly at 10 or 12 inches into a compact, heavy silt loam of similar color. At 24 to 30 inches this heavy zone grades into a light-gray or grayish-yellow smooth silt loam. The soil and upper subsoil have a low lime content, but the lower subsoil is highly calcareous.

The Yale silt loam occupies comparatively few areas. The largest lies in South Platte Valley, beginning north of Longview School and

extending eastward beyond the border of the county; and two extend east of Walrath Draw along the Lincoln Highway; these three occupy old terraces. Another area is a mile east of Pleasant Center School, adjacent to a stream channel. The surface is almost flat with a gentle slope toward the south and southeast. Drainage is everywhere good.

Nearly all the large area is under irrigation, but less than half of the other areas is under cultivation. The pasture lands support luxuriant growths of western wheat grass, buffalo grass, and grama grass. From 7 to 9 acres are required for one animal.

Wheat and corn are the leading crops, but oats are grown to some extent. Wheat, which is the cash crop, yields from 10 to 30 bushels per acre. Turkey is the principal variety. Corn yields 15 to 25 bushels on an average. The dent varieties are the most popular. Methods of tillage are identical with those on the upland soils. The land is plowed only every two or three years, but is well disked each year before seeding to grain. Most of the corn is listed, though some is planted on freshly broken sod. Small grain is planted with a press drill. Both tractors and horses are used in farming operations.

The principal crops under irrigation are wheat, corn, and alfalfa. Wheat yields range from 20 to 50 bushels per acre, and corn from 25 to 50 bushels under good cultivation. Alfalfa yields 3 to 4 tons per acre from three cuttings.

Land of this type ranges in price from $60 to $100 an acre for dry-farming areas, and from $125 to $250 an acre for irrigated land.

The soil is well adapted to corn and larger acreages might be used for this crop under dry farming. The soil absorbs and retains moisture well, as both run-off and internal drainage are slower than in the Tripp silt loam.

Yale silt loam, basin phase.—The Yale silt loam, basin phase, differs from the typical Yale silt loam mainly in the less friable nature of the material. The surface soil is a dark-brown to grayish-brown silt loam, high in organic matter, with an average depth of 10 to 12 inches. The subsoil is a dark-gray or grayish-brown compact silt loam to silty clay loam, which generally continues throughout the 3-foot section. Occasionally, however, a white, floury, highly calcareous material, similar to the Rosebud lower subsoil, over which this phase is developed, is encountered not far below 36 inches. This phase differs from the basin phase of the Bridgeport silt loam in its heavy, stiff subsoil.

This soil is widely distributed throughout the uplands in areas occupying shallow depressions. The material consists of wash from the surrounding higher soils, deposited in basins having poorer drainage than those occupied by the basin phase of the Bridgeport silt loam. The topography is flat to depressed. The drainage is generally adequate, but in places is insufficient.

Owing to its high content of organic matter and its good moisture-holding capacity, the phase is an important agricultural soil. Most of it is under cultivation, only a small proportion being in pasture land. The native grasses include western wheat grass, buffalo grass, and some grama grass.

Wheat and corn are the principal crops, wheat being the cash crop and occupying the largest acreage. Under ordinary dry-farming methods, yields vary from 10 to 35 bushels per acre, depending on the season. Both winter and spring varieties are grown, but the former leads. Turkey is now most commonly grown, but Kanred is gaining favor in some communities. Corn produces from 15 to 30 bushels per acre. Dent varieties are most popular.

Tillage practices are identical with those on the upland types, in conjunction with which these areas are farmed. The wheat and corn generally grow taller in these basins of stronger soil and more favorable conditions for the accumulation and retention of moisture. The selling price of farm land of this phase varies from $70 to $100 an acre.

Yale silt loam, heavy phase.—The surface soil of the Yale silt loam, heavy phase, consists of 6 or 8 inches of dark-brown to grayish-brown, sticky silty clay loam. This passes abruptly into a layer of 8 to 12 inches of dark-gray, heavy, plastic silty clay, which, like the surface soil, is noncalcareous. Below 16 or 18 inches the subsoil consists of dark-gray tough silty clay, slightly splotched with white lime, passing at 24 to 30 inches into gray to dark-gray or whitish silty clay. These lower layers are highly calcareous. In places a fine yellow sand, stained with iron, is reached at depths of about 40 inches.

The soil is confined to one area just west of Big Spring in the South Platte Valley. It occupies a low bench, which is flat in places, but is generally irregular, resembling an abandoned channel. The area is above overflow but is poorly drained in spots.

Only a few acres are under cultivation to corn and alfalfa. The soil produces native hay of excellent quality, the chief grasses being little salt grass, Indian grass, big bluestem, and some sweet clover. From one-half to 1 ton of hay per acre can be cut.

CASS FINE SANDY LOAM.

The surface soil of the Cass fine sandy loam consists of 8 to 12 inches of dark-gray to dark grayish brown fine sandy loam to loamy fine sand. The upper subsoil is a grayish-brown to brown sticky sandy loam or loam, 12 to 18 inches in thickness, which is slightly calcareous. The lower subsoil below depths of 24 to 30 inches is a brown loamy sand to sandy loam, which is streaked with iron rust, contains a high percentage of coarse sand and some very fine gravel, and is high in lime. In places, especially in depressions, a layer of fine gravel is encountered below the 3-foot depth. The type differs from the corresponding Laurel type in the darker color of the surface soil, the looseness of the subsoil, and the absence of the white lime layer in the lower subsoil.

This type occupies four areas in the flood plains of South Platte River. The largest is an irregular-shaped area lying adjacent to the stream bed on the south side of the river and southwest of Big Spring.

The surface is slightly irregular and hummocky, being made up of a succession of low mounds and intervening depressions. Owing to the porous nature of the soil and subsoil, drainage is adequate to excessive.

The type is relatively unimportant, except for pasture and hay production. A small part is tilled, corn being the principal crop. It is unsuited to wheat, as the soil is too light and the crop winterkills. The principal native grasses include Indian grass in the low swales, big and little bluestem, which are most abundant and are the principal grasses cut for hay, and switch grass (*Panicum virgatum*). From one-half to 1 ton of hay per acre can be cut. This land sells for $40 to $60 an acre.

This soil without irrigation is primarily adapted to hay production, although inferior to the Sarpy very fine sandy loam because of its poorer drainage. Care should be taken to prevent wind erosion on cultivated fields by keeping the surface as rough as possible.

CASS VERY FINE SANDY LOAM.

The Cass very fine sandy loam to a depth of 10 or 12 inches is a dark-gray to grayish-brown friable very fine sandy loam, fairly high in organic matter. Locally the surface layer of a few inches is a light loam. The upper subsoil is a sticky gray loam to silt loam which at 24 or 30 inches becomes darker in color and slightly more compact. Both soil and subsoil are calcareous. In places the heavy subsoil is absent, the dark-gray surface material passing into a yellowish-gray, fine or very fine sand, which continues throughout the 3-foot section.

This type is confined to the South Platte River Valley, occurring as narrow strips on both sides of the channel. A typical body is located just east of Barton on the north side of the channel. The topography is flat, sloping gently down the valley. The surface is generally well drained and is free of alkali accumulations and salt grass.

The greater part of the type is in pasture, hay land, and alfalfa. Corn, the most important grain crop, yields from 15 to 30 bushels per acre, depending on the season. Alfalfa thrives because of the excellent subirrigation and yields from 2 to 3 and occasionally 4 tons of forage per acre. The native grasses include big bluestem, Indian grass, and switch grass. Where drainage is restricted slough grass is predominant. The pastures contain very little salt grass. From one-half ton to 1¼ tons of hay can be cut from each acre, but the quality of the hay is inferior to that on the Sarpy very fine sandy loam.

Because of its productiveness and its smooth surface this type should become important. With good methods of cultivation, it is well adapted to corn and wheat, and is particularly adapted to sugar beets under irrigation. Land of this type is usually valued at $35 to $60 an acre.

CASS SILT LOAM.

The surface soil of the Cass silt loam consists of 10 to 12 inches of dark-gray to grayish-brown mellow silt loam. The upper subsoil is a gray or yellowish-gray compact loam or silt loam which is slightly calcareous. At 20 or 24 inches this passes into a brown or light-brown sandy material containing much coarse sand, some fine gravel, and iron stains. In places the heavy upper subsoil material continues throughout the 3-foot section. No part of the soil profile is highly calcareous.

The type is developed in irregular strips on the flood plains along both sides of the South Platte River. The topography is flat and slopes gently down the valley. Throughout most of the type the

drainage is adequate. The material consists of alluvial sediments which were derived largely from the black sands of Colorado.

About half of the type is under cultivation, the remainder being in pasture and hay land. The native grasses include big and little bluestem, Indian grass, and switch grass. From one-half to 1½ tons of hay is cut per acre. From 5 to 7 acres are required to pasture one cow or steer.

The cultivated crops include corn, wheat, alfalfa, and oats. A small part of the land is irrigated. Under dry farming corn yields from 15 to 35 bushels, occasionally higher, depending on the season.

Because of difficulty in handling the land and the tendency to bake if not properly tilled, it is occasionally hard to get a good stand of corn, but once a stand is obtained a crop is fairly certain. Wheat yields from 10 to 30 bushels per acre, and oats do well. Alfalfa affords three and occasionally four cuttings a season, yielding a total of 2¼ to 4 tons per acre. On this type cattle and hog raising should prove profitable, as the soil is productive of feed and the streams furnish a water supply. The land is held at prices ranging from $50 to $75 an acre.

LAUREL VERY FINE SANDY LOAM.

The surface soil of the Laurel very fine sandy loam is typically a dark-gray or brownish-gray, friable very fine sandy loam, 12 to 15 inches deep. In many places, however, the surface layer of 4 to 6 inches is light grayish brown loam or silt loam. The subsoil is a gray or yellowish-gray very fine sandy loam or loam containing alternate light and heavy layers that range in texture from fine sandy loam to silt loam. Locally the substratum below 36 inches consists of fine gravel or sand. The entire soil section has a high lime content, effervescing freely with dilute hydrochloric acid. The type is deficient in organic matter. One small area west of Ralton has a fine sandy loam texture.

The Laurel very fine sandy loam occupies the greater part of the first-bottom land along Lodgepole Creek. It is subject to frequent overflow and in places is being built up by sediments from the flood waters. The topography is nearly flat. In places the land is poorly drained; in other places the drainage is sufficient for the production of grain crops.

The type has a small total area and is not important agriculturally. The greater part is used as pasture and hay land. The native vegetation consists principally of salt grass, big bluestem, Indian grass, and some switch grass. In local areas, especially along the roadsides, there are good stands of sweet clover. From 1 to 1½ tons and occasionally 2 tons of hay are cut per acre. The hay is of excellent quality, approaching that of the hay produced on the Cass and Sarpy soils of western Nebraska. Owing to the subirrigation, corn and alfalfa are profitable crops. Corn yields from 15 to 50 bushels per acre, and alfalfa yields 2 to 4 tons of hay per acre from 3 or 4 cuttings, according to the season. This land sells for $50 to $85 an acre.

In view of the excellent pasture conditions and an adequate supply of water from Lodgepole Creek, dairying could be developed profitably on this type. The introduction of purebred stock would no doubt materially increase the profits.

LAUREL SILT LOAM.

The Laurel silt loam consists of 8 to 10 inches of brown, dark-brown, or grayish-brown heavy silt loam, which grades into a lighter colored yellowish-gray to grayish-brown more friable silt loam. Below an average depth of 20 to 24 inches the subsoil is a gray to light-gray, plastic heavy silt loam or silty clay loam. In places this passes into fine gravel and sand within the 3-foot section. The surface layer is sticky and plastic. Both soil and subsoil are highly calcareous.

The Laurel silt loam is mapped in several areas in the first bottoms along Lodgepole Creek. The largest area lies about 2 miles southeast of Chappell. The land is subject to inundation during periods of high water. Although the surface is flat, drainage over most of the type is fairly good. The material has been derived from the deposition of sediments brought down from light-colored formations of heavy texture to the west. Some of the land is in the process of formation at the present time.

The type has little agricultural importance in this county because of its small extent. About 40 per cent is under cultivation. The principal crop is alfalfa, with some corn and oats. In response to natural subirrigation and the application of some water by small irrigation canals, alfalfa yields from 2 to 4 tons of hay. Wild hay, which is excellent in quality, yields an average of 1 ton per acre. The native grasses consist of salt grass, western wheat grass, switch grass along the roadsides, and bluestem. The type is usually included in farms that embrace upland soils, and practically all the hay and corn produced is fed to stock.

No definite rotation or method of planting and handling the soil has been worked out. The land was formerly included in large ranches, and has been farmed only a few years. The farmers on this type are landowners, and no land has changed hands recently.

SARPY VERY FINE SANDY LOAM.

The surface soil of the Sarpy very fine sandy loam consists of 10 or 12 inches of light-brown to grayish-brown very fine sandy loam. This passes almost imperceptibly into a lighter brown or yellowish-gray fine sandy loam streaked with rust. The lower subsoil below 18 to 24 inches is a yellowish-brown loamy fine sand or sand containing some fine gravel. The substratum consists of fine and coarse gravel mixed with sand of all grades. The top soil is generally well supplied with organic matter, and is high in lime, effervescing freely with acid. Locally texture varies toward a loam or a fine sandy loam. In places there is only a thin layer of soil high in organic matter, underlain by yellowish-gray incoherent fine sand.

The Sarpy very fine sandy loam is confined mainly to the first bottoms of South Platte River, bordering the channel on both sides. The largest area is 2 miles southwest of Barton. The surface varies from nearly level to slightly uneven and hummocky. The drainage is fairly adequate, owing to the porous nature of the soil section, but the water table approaches the ground level very closely during high water.

The Sarpy fine sandy loam is used only for pasture and hay production. As hay meadow it is unsurpassed by any other type in the county. It supports a luxuriant growth of big bluestem and Indian

grass, with a small proportion of switch grass. The swales support cat-tails and slough grasses. Yields range from 1 to 1½ tons per acre, and the crop is very dependable owing to subirrigation.

DUNESAND.

The surface soil of the Dunesand consists of 10 to 12 inches of gray to grayish-brown sand which ranges from fine to coarse in texture and is loose and incoherent in structure. The subsoil is similar to or coarser than the soil in texture, and is lighter in color because of a lower content of organic matter. This loose sand extends beyond the 3-foot section for some depth. The sand grains are chiefly of quartz and feldspar. Dunesand does not contain enough organic matter to prevent the soil from blowing when the protective covering of grasses is removed.

The Dunesand occurs on the edge of the uplands, east of Lodgepole Creek, in the extreme southern part of the county. The surface is sharply rolling, the wind having formed a succession of monotonous dunes 10 to 75 feet high. In the rougher places "blow-outs" are common and vary the billowy appearance of the landscape. The dunes have a southeasterly trend.

Drainage is adequate throughout the type. The loose, porous soil and substratum absorb all the rainfall even on the steeper slopes. The Dunesand is unusually retentive of moisture, however, considering its loose structure.

Dunesand is of no importance in crop production. It is used almost exclusively for pasture land, a small amount of hay being cut on the more level areas. As a rule the surface is fairly well sodded. The characteristic native vegetation includes yucca, sand reed grass, and redfieldia. Small bunch grass occurs in clumps in a few places; there are scattered growths of cactus and artemisia, and a sparse growth of grama grass and buffalo grass where the surface of the ground is more compact. In the grassed pockets of old blow-outs are good growths of sand reed grass suitable for hay, and occasionally dense growths of buffalo grass. The type is capable of supporting 35 to 40 head of cattle per section. There is usually good pasturage for eight or nine months of the year. Range feeding is supplemented by winter feeding of hay during severe weather. Areas of Dunesand sell for an average of about $10 to $12 an acre.

The preservation of native sod on this land is most important. Blow-outs and overgrazed patches plainly show the disastrous effects on disturbing the soil-binding root systems. No attempt should be made to cultivate these areas, and prairie-fire control should be exercised.

SUMMARY.

Deuel County is situated in the southeastern part of the panhandle of Nebraska, in the High Plains division of the physiographic province known as the Great Plains. Its area is 439 square miles, or 280,960 acres.

The upland is a broad smooth plain, the surface of which is relieved by stream valleys, shallow depressions, and low gravelly hills. The table-lands in the southern half of the county have been dissected by Lodgepole Creek and almost effaced in the southeastern corner by the South Platte River. The upland of the northern part has a few shallow drainage ways and a slight general southeastward slope.

The alluvial lands of Deuel County border Lodgepole Creek, South Platte River, and some of their tributaries. They are flat except where modified by low ridges and abandoned channels.

The topography of the county varies from flat on the high tableland and the alluvial valley land to rough and rolling in the slope lands and dunelike in the sandy areas in the vicinity of Ralton.

The elevation of the county ranges from 3,400 and 3,700 feet in the valleys to over 3,900 feet in the uplands.

Lodgepole Creek drains about 65 square miles in the southwestern quarter of the county. South Platte River crosses the southeastern quarter and through its tributaries extends into the northern half of the county and the part of the "south table" untouched by Lodgepole Creek. Drainage is fairly well established except in depressions on the upland and in parts of the flood plains.

The population of the county in 1920 was 3,282, having increased from 1,786 in 1910, when the present county boundaries were established. Chappell is the county seat, and had a population of 1,131 in 1920.

The climate is subhumid and is characterized by cold winters and hot summers, with great extremes in temperature. The mean winter temperature is 26.4° F., and the mean summer temperature 69.8° F. The mean annual precipitation is 16.97 inches; nearly 80 per cent of this falls during the growing season, which is relatively short, averaging about 133 days. Yields are often curtailed by drought, resulting occasionally in total failures. Summer tillage (fallow with cultivation) is practiced by some farmers to prevent the effects of drought. The climate is the principal controlling factor in the agricultural development, as most of the tillable lands are fertile.

The early agriculture consisted of stock raising on the open range, but the herd law of 1887 tended to break up the large ranch holdings. The early settlers had some good crops, which invited settlement, but the drought years of 1893 and 1894 checked development until the passage of the Kincaid Act in 1905, when combined stock raising and farming began to prove profitable. Following demands for increased production and the greater perfection of motor machinery, "big" farming was inaugurated in 1915 and has been steadily promoted.

Wheat occupies the largest acreage among the cultivated crops and is the cash crop. Almost 95 per cent of the wheat grown is winter wheat. Corn occupies about half as much land as wheat and is second in importance. Alfalfa, oats, wild hay, and rye are next in importance in the order named. Alfalfa is the principal hay crop; most of it is produced on irrigated or subirrigated bottom land. Wild hay is an important source of cattle feed. Some sugar beets are grown under irrigation. Sorghums, millet, emmer, potatoes, and Sudan grass constitute the less important crops. Garden vegetables and potatoes are grown merely for home use and local markets. Excepting cherries, orchard fruits as a rule do not succeed.

The raising and feeding of livestock, combined with grain farming, is an important industry in parts of the county. Most of the cattle are shipped to Omaha as stockers and feeders. Grade Herefords and Shorthorns predominate in the herds.

There are several dairy herds consisting of grade animals. Most farmers keep a few milk cows and raise some poultry and hogs.

Land values range from $10 to $17 for grazing land to a maximum of $250 an acre for irrigated land.

The soils of the county, on the basis of the origin of the parent material, may be grouped as follows: (1) Residual soils, (2) soils derived chiefly from wind-laid deposits, (3) soils derived from stream-laid terrace deposits, (4) soils derived from recent-alluvial or flood-plain deposits, (5) miscellaneous soils.

The Rosebud types are the most extensive upland soils. They occur in areas varying from a few acres to large tracts, on the table-land and some of the slope land. The silt loam, with its deep phase, is one of the most important agricultural types. Most crops common to the region can be successfully grown on these soils, except on the gravelly type, which is used chiefly for grazing.

The Dawes silt loam is extensive and is one of the best dry-farming soils in the High Plains region. It is deep, fertile, productive, and retentive of moisture. Wheat and corn are the principal crops.

The Keith silt loam is very productive under favorable moisture conditions. It is uniform in texture and color and is well adapted to general farming, especially the production of small grains.

The Colby silt loam is used chiefly for grazing and hay land, but the smoother areas are very suitable for general farming and are nearly as productive as the Keith silt loam.

The Scott silty clay occupies small depressions on the table-lands and alluvial lands. It is of little agricultural value, owing to its poor drainage and tough impervious subsoil.

The Canyon soils are used principally for grazing. The underlying formations lie too close to the surface to insure favorable crop production.

The Valentine types are valuable chiefly for grazing and hay production. The soils are low in organic matter and tend to drift when cultivated. Dunesand has value only as grazing land.

The Cheyenne soils are droughty on account of the loose porous subsoil, but under irrigation or the best dry-farming methods they are reasonably productive.

The types of the Tripp series are excellent terrace soils. They are as productive as the Rosebud types and are well adapted to grain growing. The sandiest member is subject to drifting. Some of the silt loam type is irrigated.

The Bridgeport types are fairly extensive old-alluvial soils. They are agriculturally important; especially the silt loam with its basin phase. The heavier members are suited to general farm crops, but the lighter types drift when not properly handled.

The Yale silt loam is well adapted to grain growing. Most of it is under cultivation, and some is irrigated. Wheat, corn, and alfalfa are the leading crops.

The Cass soils are very important bottom-land soils and are confined to the valley of the South Platte. Hay is the important crop on the coarser members, but parts of the silt loam are under irrigation. Corn, wheat, alfalfa, and oats are the cultivated crops.

The Laurel soils occur as narrow strips on the flood plains adjacent to Lodgepole Creek. Corn and alfalfa are grown, but most of the land is left in meadow for native hay.

The Sarpy very fine sandy loam is confined to the lowest flood plains of South Platte River. It produces a luxuriant and very dependable growth of bluestem grass used chiefly for hay.

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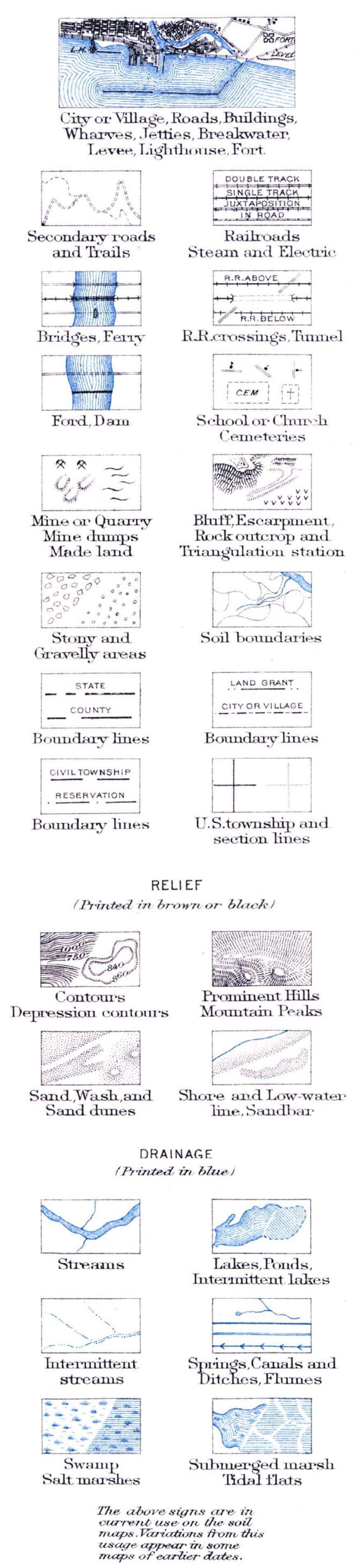
BUREAU OF SOILS
IN COOPERATION WITH THE
STATE SOIL SURVEY OF THE
UNIVERSITY OF NEBRASKA

SOIL MAP

NEBRASKA
DEUEL COUNTY SHEET

CONVENTIONAL SIGNS



LEGEND

- Bridgeport fine sandy loam — Bf
- Bridgeport loam — Bl
- Bridgeport silt loam — Bs
  - Bs — Basin phase
- Canyon gravelly sandy loam — Cn
- Canyon silt loam — Ca
- Cass fine sandy loam — Cf
- Cass very fine sandy loam — Cv
- Cass silt loam — C
- Cheyenne gravelly sandy loam — Cg
- Cheyenne fine sandy loam — Cy
- Cheyenne loam — Cl
- Colby silt loam — Cs
- Dawes silt loam — Ds
- Keith silt loam — K
- Laurel very fine sandy loam — L
- Laurel silt loam — Ll
- Rosebud gravelly sandy loam — Rg
- Rosebud fine sandy loam — Rb
  - Rb — Deep phase
- Rosebud loam — Rm
  - Rm — Deep phase
- Rosebud silt loam — Rs
  - Rs — Deep phase
- Sarpy very fine sandy loam — Sv
- Scott silty clay — Sc
- Tripp very fine sandy loam — Tv
- Tripp silt loam — Tp
- Valentine loamy fine sand — V
- Valentine fine sandy loam — Vs
- Yale silt loam — Ys
  - Ys — Basin phase
  - Ys — Heavy phase
- Dunesand — D

Soils surveyed by Louis A. Wolfanger, in charge, and A. W. Goke of the U. S. Department of Agriculture and H. E. Weakley of the Nebraska Soil Survey

Scale 1 inch=1 mile

Field Operations
Bureau of Soils
1921